JOURNAL
OF THE
BOARD OF AGRICULTURE
OF
BRITISH GUIANA.

VOL. XII. APRIL, 1919. No. 2

PLAIN SPEAKING.

In this issue we reproduce under "Plant Diseases and Pests Notes" some exceedingly refreshing extracts from a letter written by Mr. C. O. Farquharson late Mycologist of Southern Nigeria to the Assistant Director of Kew. This letter has already been published in the Kew Bulletin and quite recently portions therefrom under the caption "A broader Mycology" appeared in the Barbados "Agricultural News." There are so many points of extreme interest both to the layman and the official agriculturist that we offer no apology for reproducing once more certain parts of this letter.

Many of the points which Mr. Farquharson makes very probably voice what more than one worker in tropical scientific agriculture has thought often enough though has not cared—or possibly dared—to include in any official report or publication.

Work such as the official position of Mr. Farquharson entailed, and which he so aptly describes, is, if undertaken with a keen sense of duty such as he displayed, by no means that "series of smooth running experiments performed under genial conditions and at no particular physical discomfort" which not infrequently is the sum of the criticisms levelled at labours of this kind. The remarks which Mr. Farquharson makes with regard to drainage problems are sound; the connection between the manipulation of a microscope one-twelfth-inch objective and the digging of drains is not so indistinct as would at first sight appear. We have known quite a few manipulators of entomological pins and the microscope to whom a practical study of the elementary

principles of drainage and other kindred agricultural practices would be distinctly beneficial in their prosecution of plant pests or diseases.

The short but pithy observations which this gentleman records on Budrot probably come nearer, to a solution of this much-discussed malady of the coconut palm than many published Bulletins running to one hundred pages.

We fully agree with the concluding sentence of our contemporary* on this same subject of the absolute necessity of combining a practical knowledge of agriculture with the science thereof —"absence of this knowledge in scientific men often leads the general public to regard them as devoid of common understanding and ever at times as subjects of unseemly jests."

GARDEN, FIELD AND FOREST†.

Aeta: early fruiting:—A plant of the Aeta palm *Mauritia flexuosa*—planted about eight years ago, and raised from seed a year before, is now fruiting for the first time at the Botanic Gardens, bearing two panicles, the first that have appeared on the plant. It has no clear stem yet, all the leaves springing from the ground. I do not think this palm usually bears so early in life, as I cannot recall meeting in the interior any plant of the size in fruit. One would think the hard solid seed of the Aeta might be turned to account for making buttons and other small articles, as the seed of another palm, the ivory-nut,—*Phytelephas macrocarpa*—is.

How to prepare Cocoa:—Cocoa is generally used in one or other of the very numerous manufactured states which pass under the name of chocolate, as powder, paste, cakes, sticks, balls etc. These consist of the ground nibs or beans, in most cases mixed with various foreign ingredients, most or all of which are harmless, but still adulterants of the pure cocoa. But these mixtures are not confined to foreign cocoa; the sticks, balls and cakes made in this colony are largely adulterated with similar substances —ground rice, flour, etc, roasted which the makers are able to

*Agricultural News, Barbados, May 3rd, 1919.

† *Reprinted by permission of the Daily Argosy Co.*

obtain cheaper than pure cocoa beans. Unlike our other breakfast or afternoon beverages, tea and coffee which comprise merely the essence of the leaves or beans employed, in chocolate the entire bean (and whatever substances the manufacturers may have mixed with it) is taken by the consumer ; and it is therefore a food, in the sense of containing solid matter, as well as a liquid ; just as the Irishman's home-grown tobacco was "dhrink as well as smoke" to him, because of the great amount of water it contained. But for the fact that by the admixtures in manufacture, it is made very palatable, there is no more reason why we should enitrely consume our cocoa nibs than our coffee beans or our tea leaves. This residue substance is no recommendation or improvement to a cup of cocoa, rather the reverse indeed, and the general practice of taking it seems to be due, like numerous other customs to which we submit, or that the force of custom has made us think proper, to the imposition of the manufacturing trade, which, having industriously kept the market supplied with the manufactured composite article, is responsible for the general ignorance as to how pure cocoa is made ; to explain which, is the object of this note, the process being as simple as making tea or coffee. I may mention as a further recommendation that in dietaries from which tea, coffee and the ordinary forms of chocolate are excluded, because of their indigestibleness to persons of weak stomachs, this form of pure cocoa is as a rule, included, and strongly recommended. Now as to making. Having obtained the properly cured nibs or beans, seeing first that they are of good quality—for it is folly to us a poor article when a better can as easily be had—take about half-a-pound (or more or less as circumstances may require) and place them in a metal dish or quite clean frying pan over a moderately brisk fire, and roast ; keeping them stirred, till the skin is sufficiently parched to crack them under pressure between the finger and thumb,—a process which occupies about eight to ten minutes. An ordinary coffee roaster would probably do as well for the purpose as a metal dish or pan. Then remove the pan from the fire, and allow the beans to cool sufficiently, and only sufficiently, to be handled. While in this state remove the skin by taking each bean and pressing it between the finger and thumb, with a little friction, rub the parchment off. If not removed while hot it

becomes tough again, and is not then so easily broken away. Half a pound may have the parchment removed in this way in a minute by dexterous rubbing, so that no one need be deterred by fear of its being a tedious operation. Next, while the beans are still warm, crush them with a rolling pin, or its general substitute here, a bottle, on a sheet of paper, till they are reduced to a rough powder, the grains of which are about the size of the head of a pin, a portion—the larger part—coarser, and some necessarily finer. The hot beans crush easily, and this operation need not occupy more than a minute or two. When cold, place the ground cocoa in a bottle or jar, cork it, and put away for use from day to day as required. I must now described the making of the beverage. Take the quantity of cocoa, measured on the basis of three or four teaspoonfuls (from half to three-quarters ozs.) for each breakfast cup, required, and place in a saucepan or other suitable vessel. In putting the water add one third more that the quantity of beverage required when it is done, to allow for boiling away. Then set the saucepan on the stove near, but not over, the fire to simmer for one and a half or two hours. The cocoa should then be strained off, through a flannel bag, (the excess of water before mentioned having evaporated) a clear brown liquid without fat or any other pernicious substance, being the result. It is then fit to use, with the addition of sugar, and about one-third its quantity of milk (or more if preferred) about the proportion in fact that is added to well made coffee. In temperate countries, if not convenient to make it every day, sufficient can be made at once to last two or three days, the portion to be warmed again as required for use; for, unlike tea and coffee, it does not, with a low temperature, seem to suffer in taste by being kept and warmed afresh ; but in this climate it is better made from day to day. After very little experience, I think most persons who take my advice and use cocoa in this form, will agree with me, and acknowledge, that it is much superior to the composite mixture produced by the chocolate manufacturers ; in spite of the celebrity that world-wide advertising has given to some of them. But from this personal and selfish form of persuasion I may turn to another, which is the principal object of this note—the public good. If every one in the colony who drinks cocoa or coffee daily would

use only that locally produced, they would help to give a powerful stimulus to these infant and lagging industries, and encourage men of small means to go in for a form of agriculture in which they might hope to realise a comfortable and independent living. The general public would further benefit by the very large sum of money, which is now sent abroad for manufactured cocoa and coffee, being kept circulating within the colony. Our coffee was at one time esteemed as among the best producd anywhere in the world ; what our forefathers produced, no doubt we can, if we care to try, produce again. As to our cocoa, from numerous samples that I have seen, I am sure no part of the world can produce a better quality of bean, through from faulty preparation very inferior stuff is often sold in town. Let us, in the revival of these minor industries, show, by using the products ourselves, that we believe in our own capacity to produce a good article ; for largely by this personal proof of good faith the world judges, and bestows or witholds its patronage and esteem.

Teal Duck :—Another water bird I have lately [this note was written in October] observed on the lakes of the Botanic Gardens is the blue teal duck, *Pterocyanea discors*. It is a migrant, coming southward from Canada and the United States, when the breeding season is spent, and is found on the coast lands of Guiana in the autumn or late summer months, and is frequently shot, the people calling it "steel duck," evidently a corruption of teal. It is about the size of a wild English duck, and weighs about three-quarters of a pound. The head, neck and breast are gray-brown, spotted black, with a slightly bluish tinge, more whitish toward the vent beneath ; the back blackish ; the feathers edged gray-brown. The shoulder of the wing is slate-blue, edged along the base with a band of white, the long feathers of the outer joint blackish : the under side of the wings whitish. The extreme length of the bird is about 16 inches. The toes are hooked, the three fore ones webbed of course, and the hinder one very small and free.

Mucca-mucca :—*Montrichardia arborescens, Schott*, is probably the largest arborescent aroid in the world. The stems are simple or branched, a foot and a half in circumference, and 20 feet or more high, in situations where they reach full development. The leaves, which are one, to one and

a half feet each way, with deep sinus and auricles, are clustered at the top of the stem, erect or spreading, held up at an angle, usually an acute one, with the petioles, the back being thus turned outwards, with prominent horizontal whitish primary veins, which are very conspicuous in the light green pellucid substance. The flowers are produced among the leaves, singly from the axils of the footstalks, the spathes, which are the shape of grocers' sugar papers, being erect, about a span long, creamy white inside and green out, deciduous, as is the male portion of the spiki-form spadix, leaving the fruit exposed in the form, when fully developed, of a large potato, the male flowers having been aggregated separately in the outer deciduous part, and the female in the more permanent lower. When ripe the fruit gradually breaks up, in divisions like the cells of honeycomb, and the seeds, which are the size of marbles, one in each division, enclosed in pulp, drop, and float on the river, in which they germinate if not soon stranded in a situation suitable for growth. Fish and other animals, however, eat many of them. In places where drift accumulates large quantities are often found, floating or stranded, all, if germinated, with a single leafshoot protruding, the plant being a monocotyledon. There are two species recognised now, *M. arborecens* and *M. aculeata*, one being armed in the stem with copious prickles, the other quite smooth. Both were considered one species for many years, and still go by the same common name of mucca-mucca in British Guiana, where they form perhaps the commonest vegetation of the country and certainly to travellers on the rivers the most familiar and obtrusive. From the estuaries of the rivers exte[illegible]any many miles inland, mucca-mucca serves an important physical purpose in protecting the banks from wash, and in making up new ground. It lines the banks in broad lands of vivid green, growing in the untraversable mud and water, forming dense and absolutely impenetrable thickets. Less abundantly it is found in the shaded creeks, and in all very wet alluvial places. Its greatest luxuriance is however displayed within tidal influence on the rivers. The stems in specific gravity are exceedingly light, light as cork, or even ligther when dry, and contain a large quantity of fibre that might, one would think, be turned to some useful commercial purpose. The natural range of mucca-

mucca is from Guadeloupe and Trinidad to Guiana. It was first described and figured by Plumier two centuries ago, Linnaeus ascribed it to the genus *Arum*, and other botanists subsequently to *Caladium*. Crueger differentiated the second species, *aculeata*, and created the genus *Montrichardia* for the reception of both.

Shipook :—One of my objects in calling attention to the subject of the habits of the shipook *Ardea cyanurus*, is to record the immense number of snails continually devoured in the gardens by it. These snails, for the determination of which I am indebted, as I am also for the scientific names of the birds mentioned from time to time in these columns, to Mr. Quelch, are of two species. Both are strictly aquatic, living constantly in the water, the edge of which when it is deep, as in artificial lakes and trenches, they only approach occasionally, by which chance they fall a prey to the vigilant shipook. They creep about on the bottom, and on the plants that grow in the water, or float and travel at the surface ; and sink at will, going to the bottom rapidly like a stone thrown in, and seem, to the observer, of abnormal appetite. They devour an immense quantity of vegetable food, and must keep down vegetation greatly by the amount of young shoots and germinating plants they eat. Indeed it is not only young shoots they consume, for great quantities of the smaller floating plants are wholly devoured by them. Part of the difficulty of at first stocking water with new plants is, I think, most likely due to their ravages. Their eggs are deposited above the surface, in masses agglutined together on the stems of grass and other plants that grow through the water, where, as they hatch by lapse of time the tiny young snails drop into the water, where they begin life, the majority at this stage falling a prey no doubt to fish and other aquatic animals. These clusters of eggs are never in any way concealed or protected, and are conspicuous objects to all terrestial and aerial creatures, yet I have never observed that anything ever preys upon them. For many years I had supposed, though without conscious thought on the subject, that the snails in the lakes were all of one species ; but I was led to suspect a second among them by noticing that some few of the clusters of eggs were a different colour and shape from the rest. Instead of being light green

and oblong in form, these clusters were pink, and more oval and more oval and flatter in form, though in many cases they approached in outline the other clusters. But when inspected at close quarters other distinctions were seen—the eggs of the pink clusters were more numerous, only about one-third the size, and though touching each other, not compressed laterally, nor cemented together as those of the green groups were and the young snails when hatched were only half the size of their allies. These differences convinced me there were two species which belief was confirmed by a close examination of the shells, from which I was diverted however for a considerable time by finding only those of the commoner kind in my search for them. Both vary considerably in size and colour, but all the individuals of each species are unmistakably of like structural character, and from one to two inches in diameter. *Ampullaria zonata* is usually the commoner kind. It is nearly globose in shape, but varies much in colour and size, the differences of size being due doubtless to differences of age. Some are concolorous, but vary from a very light to a very dark or blackish brown. Others are in various degree of clearness or obscurity marked with alternate zones of horizontal brown and grey or yellowish-white bands or stripes. The convolutions of the shell end in a circular and deep orifice large enough to admit of the end of the little finger of one's hand being inserted. This species lays the green eggs. The other species, *Ampullaria papyracea*, is a different shape, less globose than its ally, with only a very slight orifice where the convolutions of the shell end. This character alone readily distinguishes the species. The shell is much thinner, hence the name *papyracea*, the colour more uniform, dark brown, with usually faint zonal bands. Mr. Quelch has shown me the shell of a third similarly large species, which was recently found in a trench in Georgetown ; and Mr. McTurk has described to me a much larger snail, the shell of which is as large as an orange, which is found up the creeks and in other moist places of the forest of the interior, and which the Indians gather and eat. Though the two species I have described inhabit the same waters, each kind seems to keep to a large extent by itself, for I observe that where the shipook has destroyed them, the shells of one kind predominate in one place, though rarely entirely alone, and

the other in another place, likewise having few or several of the other kind mixed with them. Their fecundity is enormous. If we possessed the wide gastronomic taste of Frenchmen, or of our own aborginal population, we might perhaps turn these abundant snails to our service in making palatable dishes ; for being vegetable feeders possibly they may be as good for human food as the European terrestrial snail. There is a common fishing hawk, of a very variable species, which is plentiful, and constantly present about the lakes and trenches of the gardens, which I am told also devours these snails ; but I have not personally been able to verify the fact, though I have watched closely. If observed for any length of time it is seen to fly down from the branch on which it has been perched, touch the surface of the water, and fly off with whatever it has captured in its claws. Possibly, or indeed most likely, the snails are taken in this way, as they are shifting their feeding ground by floating and travelling on the surface of the water. Several hawks, of a common general resemblance as seen perched or on the wing, but of varying colour and size, are always present, chiefly on the trees about the lakes and trenches of the gardens. Whether these represent a varying species, or more that one species I have long been uncertain. On this subject Mr. Quelch writes : "Some of the long curved-bill hawks are so much alike that it would be risky to say, unless it were in one's hand, what yours is. The males and females and the young birds differ a good deal also, so that at a little distance it is easy to mistake them. Most likely it is *Rosthramus leucoypgus*, but it may possibly be *R. sociabilis*, or even *Leptodon cayennensis*, or possibly even all three." How the snails are able to float and sink at will I have not with any certainty discovered. So far as I have observed they can only start in this method of travel by creeping to the edge of the water first, thus gaining access to the air, which probably by some means they seal some portion of within the shell, and this enables them to float, progression being effected by contraciton and expansion of the body as it is extended from the shell. If this be the case, which, as I have said, I offer only in the way of conjecture as an explanation, by letting the air escape at will they would sink rapidly to the bottom again, as they are observed to do.

DETAILS

By Edgar Beckett.

Our villagers, and even some of our householders in city and town, might do something with their house-lots both with respect to beautifying their homes and making an addition to their income.

There are numbers of things that should yield a profitable return, provided that attention is given to little details, care taken to prevent wastage of this or that—from the ashes from the fire place, to the plantain and other "skins" usually found in the kitchen.

In the towns a man who owns his own house-lot, say, for example, in Queenstown Ward, might easily cultivate half-a-dozen avocado pear trees, one or two mangoes, and half-a-dozen sweet orange trees.

But the pear trees must be from selected seed, the trees must be properly planted—the tap-root must be removed with a very sharp knife, and the greatest care taken that no injury is occasioned to the root hairs.

Proper mounds must be made, the holes filled with soil well mixed with dung, good rotten leaves or grasses. The plants must be carefully staked so as to avoid any shaking about in the hole—they should be at least twenty feet apart.

The mangoes should consist of grafts—any number of which can be obtained from the Botanic Gardens. There are numbers from which a selection can be made—possibly the "D'Or" or the "Peters" varieties might be the most useful to select. Here again, every care in the planting would have to be taken, if quick and vigorous growth is to be expected. The sweet oranges might consist of tangerine and selections from the best of our local fruit i.e. sweet and juicy, with good size, flavour and appearance.

If all the little details as to correct preparation of the holes, correct spacing and planting are carried out, a successful start for the trees is fairly certain to be obtained.

Then as to after cultivation. The area occupied must be kept free from weeds to prevent the plants getting hot about the roots, a liberal mulch of rice straw is most important. Indeed, in periods of drought the lives of your plants may be saved by mulching the whole area with rice straw. A littl forking will be necessary from time to time. Attention mus be given to such details, small but very important, as to forkin around the trees standing with one's back to the stem, and to avoi forking too deeply over the feeding area as most of these root are on the surface. A full fork can be taken when the righ distance is obtained so as to allow of the easy spreading of th roots.

Then the cleanings and rakings from the poultry house, an if it is possible to obtain it, a little well-rotted cow manure shoul be worked into the soil with the fork, about two or three fee from the stem, in a thoroughly business-like manner. During th period whilst the trees are growing, (the delight and pride on takes in their growth is not the least of all the joys of "growin things") a crop of black-eyed pease or some such legume ca be grown between the rows.

As the trees grow, with the exception of the orange, ther will be very little pruning necessary. An avocado pear tre from selected seed, carefully planted and tended will bea hundreds of fruit at a single crop of the most luscious flavou and the most delicate taste. Every year this fruit is becomin more popular, it is considered by pomologists to be one of th most highly prized of all our tropical fruits. Those of u who have tasted the variety known as the "Golden Pear" wit its pleasant creamy, firm and consistent flesh, of a rich delicat nutty flavour, can confirm the opinion as to the value of thi fruit.

Eaten with black-pepper and salt it is excellent, and when compounded into a delicious salad it deserves a better name than midshipman's butter—an appelation sometimes bestowed upon it.

The D'Or or any other choice mango-graft, yields most abundantly and the fruit will always command a ready sale. Sweet oranges are always in demand and obtain a fair price, as do such other citrus fruit as shaddock and grape-fruit.

With the exercise then of a little care and with considerable attention to details, it is quite possible for a man to put in pleasant and profitable occupation during his spare time.

Take some of our village girls. Many of these think themselves unfit for work " aback " in their mother's "beds," some of them are not strong enough for this—these, at the least, might get their menfolk to securely fence their lot, and by careful attention to details might readily earn every year fair sums of money from the careful cultivation of such fruit trees as Avocado Pears, oranges and grape-fruit, custard and sugar apples, sapodillas and star-apples, choice strawberry guavas and such like.

Again a pig or two properly housed might easily bring in a substantial sum each year, whilst a milch cow of a good strain properly looked after and treated in the way it should be, will give an abundance of milk of a superior quality. Even the despised goat will repay considerable attention as to details.

We have not mentioned the Bread fruit tree. This valuable tree always calls to mind the mutiny of the crew of the "Bounty," Lieutenant Bligh having procured all the plants he required the whole plan was upset by the mutiny—a successful attempt to introduce them from the South Seas being successful some four years later. A well-grown and properly cultivated Bread fruit and its sister the Bread nut tree will produce enormous crops, and one tree should certainly bring in a few dollars every year. All the yard sweepings and wood-ashes would be of use to such trees. In spite of the value of the Bread fruit very few trees are found in this colony.

Then poultry. The absence of attention to details in this connection is most deplorable. Their food supply does not occupy any attention, it is given anyhow with not the slightest regard to change of diet. Their water supply is such as to make one shudder, the stock are fed very late in the morning; the birds themselves are frequently covered with lice. Very few, if any of our villagers clean their fowl-pens every day —whilst the roosts (generally the most uncomfortable imaginable) are often never washed from one year's end to the other. Little care as to breed is excercised whilst in-breeding

does not seem to alarm the owners over much—there is no system at all in this respect.

A well-filled dust and ashes box carefully shielded from rain so that the birds may have their dust bath regularly, is often not seen at all, and if there is any box it is seldom re-filled with fresh dust and ashes—though this should be done every two weeks.

Such details as a little linseed meal in the food, pounded burnt bones, a few large wood ants' nests, an occasional allowance of old tea leaves and a pint or two of sun flower seeds are often entirely neglected.

The regular diet of Indian corn that is so much a favourite in this colony is a great mistake—the diet must be changed as much as possible.

The boys frequently with their cast nets catch, *"korass" and all manner of bush fish, which often are not eaten—these, boiled to rags, make splendid occasional food for fowls ; whilst hard-backs, pond flies and marabuntas, will come in very useful for the young birds. A detail of importance which should not be overlooked, is to feed young birds separately from those old and full-grown. A full-grown cock or hen takes great delight in bullying the smaller stock, which in this way are very often under-fed just at the very time when they need all the food you can give them. If the giving of grit, such as shell, etc., is not attended to, your fowls are certain to be in poor health.

A family can easily grow sufficient coffee and cacao to supply their own wants, and with a little trouble castor beans can be grown, and so save many a penny being spent in the Portuguese shop for a poorer substitute as a luminant in the shape of kerosene oil. Attention to details in the preparation of food is often sadly lacking. The most unpalatable food is sometimes served up owing to the lack of attention to details and to the fact that the habit of making and getting the most out of everything has never been acquired.

Bees, if given the care and attention they deserve, can be made into a most profitable undertaking by many of our village

---

*"*Cuirass*"—a fish (*Arius. spp.*)

girls who now find so little to interest them in life—some of our town girls would be much better occupied in the keeping of bees than in brooding over their many disappointments.

The lives of some of our young women are pathetic in their want of interest—they simply drift through life, their womanly instincts crushed through no fault of their own, until unhappy old age crowns a life as useless as it has been deformed. To such, an interest in plants or bees, poultry or what not, would be the means of keeping the soul alive.

The mistake many of our villagers and others make, is, that they expect to at once make a great deal of money in return for very little attention to details. If disappointment comes in poor prices or small crops—instantly disgust creeps in. This is a great mistake, and a mistake that is often due to greed. The old creole proverb of "Big eye choke dog" is as admirable in its truth as in its wide applicability in this colony. As good old *Quow has it:*

"Like ebery foolis' Niggah,
Him neber satisfy,
And wen he hab good bidiness
Make nyanga* kok he eye."

For any work to be successful the right hand (as Dickens has it in one of his letters) must do it with the heart in it. For work such as we have outlined there must be a living interest, and it is when this interest is aroused, that one finds the attention to details no longer appearing as abominable nuisances, and the whole work as a dreary drudge—on the contrary there will be awakened a spirit of pride and pleasure, which will raise such work from drudgery to a profession. With it will follow a vast improvement in health and spirits, and if persistent energy is kept up in spite of minor disappointments at various periods, there will be in the end complete success from the financial point of view. The chief difficulty (probably due to malaria) is to get our people sufficiently interested to use their brains in this direction. Efforts of this sort often end in failure, because of the want of continued effort, the neglect of attention to details, and

**A dude.*

sometimes, because they who do make a start, are not the type of person who could possibly succeed—being no lovers of Nature, out of sympathy with plants and animals, and can never hope to do much with the soil owing to a natural want of aptitude for labour of this sort. To those who are keen on work of this kind, however, if attention to details is never lost sight of, we believe that the "briers of this working day world" will not scratch or impede them very much as they push onward towards the goal of success.

THE SUGAR INDUSTRY OF BRITISH GUIANA

By H. E. Murray.

There has been so much said and written in connection with the premier industry of this Colony that I feel loth to write more on the subject, but at the request of a friend I have promised to contribute this article, and if it does any good I shall not grudge the time taken in its preparation.

The sugar estates' proprietors and planters are a much maligned lot. Fortunately or unfortunately, according to the point from which their actions have been viewed, they are on the whole a broad-shouldered lot, and, like the British mastiff, they trot along taking no notice of the small dogs yelping at them. We have been and are still being told that sugar has been the curse of the Colony, but the wiseacres who make these charges offer no substitute for it. We have the rice industry, but the practical man knows it can never take the place of sugar. The planters have fostered the rice industry as a means of keeping East Indians in the Colony and for the purpose of reducing the cost of living, recognising as they have done that if people have to live on small wages the cost of living should be in harmony with the wages. The fact that none of the growlers against sugar have started any other industry to take its place proves either that there is no other industry that can, or that the growlers belong to the well known class of fault-finders—and not fault-menders. No one can have everything in this world. If one

wants cheap living one must expect low wages, etc., and often no work. That is the fetish of the British working classes; that is what they were suffering from before the war and I fear they may suffer from again. Speaking for myself, so long as I can earn sufficient to live comforably on I do not care whether things are dear or cheap. To put it shortly, what does it matter to the working man how cheap the cost of living is if he has no work and can earn no money? That was often the case in Great Britain. On the other hand if one can get plenty of work at good wages what does it matter what the cost of living is? This may perhaps be considered to be outside the lines I was asked to write on, but I think it leads up to what I am aiming at, and that is to prove that the British nation, and not the sugar estates' proprietors and planters, is responsible for the low rate of wages that pertained in this Colony from the end of 1884 to the outbreak of the war. The British nation wanted cheap sugar; it did not care what the sugar cost to produce or where it came from.

The European nations, knowing the value of a production that put a large amount of money in circulation and gave work to a large number of people, fostered the beet sugar industry. That was done by the means of Bounties and Kartels, and though it is strictly opposed to real Free Trade, the British consumers' looking only to the cheapness of the article, bought it and sacrificed not only their sugar-producing Colonies and their refiners at home, but their honour. These are the facts that can't be denied.

The writer came to this Colony in 1877, and being the son of a sugar planter, and knowing at the time the conditions that obtained in Antigua, Grenada and Barbados, can say positively that for all the classess of work, and at all times of the year, the labourers here got twice as much as they did in the Islands named, and in some cases five and six times as much. These are conservative figures. The price of labour was ruled, as most things are, by supply and demand; sugar was then a good price, and on well-conducted estates there was a fair profit in producing it; consequently there was competition for labour, and it was no uncommon thing for labourers, mostly men, to

leave their homes and go to some estate miles off and stay away several weeks, earning on such occasions from four to eight shillings a day. I am sure no planter grudged the labourers these wages, nor did the estates' proprietors, for no less an authority than the late Honourable William Russell laid it down that the manager producing sugar for under $96.00 a ton was robbing his proprietor. These facts are well-known by my contemporaries, and can be ascertained by all who really want to know the truth.

Now, let us turn to 1884. Owing to an ever increasing beet sugar crop, the price of sugar fell suddenly to a figure considerably below the cost of production, and year by year it fell lower and lower. The bulk of the old time sugar planters considered sugar should be abandoned and said it could not be produced at the price, but others took what I hold was the sensible view of the situation, and they said, "Till we can find a substitute to pay better than sugar, even at these prices, we must stick to it, and we must cut our clothes according to our cloth." Then we had to aim at producing sugar for £8. a ton instead of £20. Bear in mind that previous to 1884 rice was not grown to any extent, and that it was the planters on the sugar estates that put it on a sound business basis.

There are people, and not only the great unwashed, who say the men who carried on sugar under the conditions I have named were wrong. Perhaps they were, but I for one can't see it. If starving I would always be thankful for half a loaf rather than no bread. Sugar estates went on, and the hard-working man not only lived but saved some money. The villagers, who could do better, would not accept the rate of wages offered, and I have no quarrel with them for that ; but they still lived out of the estates, for commonsense will tell my readers that it was only the money that the estates put in circulation that was to be found in the country districts. Yet these villagers, or many of them, played the part of the dog in the manger. They condemned the introduction of labourers who thrived and did well on the wages that the estates could afford to pay, and who kept up not only the estates but the very villagers—for it was to these East Indians that our villagers sold their small stock, provisions, fowls, eggs,

and so on, and later on the East Indians bought and rented land from these very villagers. If sugar had been abandoned we should gradually but surely have gone back to our savage state. I can hear some wiseacre saying, "Oh! something else would have taken its place." But if that is so, why was that something not introduced when there was so much discontent with sugar? "A bird in the hand is worth two in the bush."

The war came, and the British nation suddenly found that its enemies commanded its sugar markets. The price of sugar went up with the increasing demand, and up went the wages here. What the future of sugar is to be no one can tell, as so much depends on the future policy of the British Government. We can hardly conceive that things will be allowed to go back to their pre-war condition; but one can never tell, and we must be prepared for the worst.

The question is, What must Capital and Labour do to ensure the future of the sugar industry in this Colony?

So far as Capital is concerned the question is easily answered. The capitalist must build really up-to-date factories. An up-to-date factory is one that allows of all the sucrose in the cane, that it pays to extract, being extracted, that can make all the steam or motive power it needs from megass, and that requires the minimum number of people to work it.

The advantages of such a factory are readily seen. The greater the extraction of sugar from the cane the more valuable the canes become, and the lower the cost of manufacture the larger the gain.

In addition to being up-to-date, factories must be on large lines. When things become normal I do not think that a factory of less than 5,000 tons can pay; they must run to 25,000 and 30,000 tons. This Colony has the advantage over most others in that it is able to grind nearly all the year round, and consequently does not need such a powerful plant of machinery as those places that have to reap all their canes in six months. This means that a factory, to take off 5,000 tons here, will cost considerably less than it would cost in a place that had to do it in six months, and this makes a saving in interest on capital. I take it that one and all recognise that night and

day work is a *sine qua non.* Machinery only pays when at work.[1]

Now I will turn to the labour question, which in this case means cultivation, or the production of canes. Capital can't be expected to spend huge sums on large up-to-date factories till it sees where the canes are to come from. How are these canes to be grown ? Will it be best to continue on the lines that have been in vogue here with the assistance of mechanical implements, or will it be better to introduce cane-farming on a large scale ? I favour the latter course, as I believe it to be in the best interests of one and all. We all know the present system and the objections to it, and I fear that even with up-to-date factories and the introduction of mechanical tillage, we can't hope to progress on those lines.

There are objections to cane-farming, and we have still to educate the small farmer up to its value ; but it appears to me that this will be an easier task than educating him to work regularly and steadily for a wage and for some one else. If cane-farming is to succeed the people must be taught to farm on a sound basis, and the work must be carried out on business lines. To see that this is done must be the duty of the Staff of the Estates. The farmer must be taught, and shown the advantage of doing what he is taught. The farmer who is not willing to work on these lines should be " fired " out—there must be no black sheep in the flock.

Agriculture in the true meaning of the word must be instilled into the farmers. They must be taught that there is only one season for doing work, and that is the right one. Cultivation, like Time and Tide, waits for no man. Work done at the right time pays handsomely, while work done at the wrong time is often a waste of money, and it certainly never pays as it would have done if it had been done at the right time. I need hardly say that whatever work is done it should be of a good quality. The farmer must not take up at one time more land than he can easily handle—that is, with regard to doing the right work and doing it at the right time—but that does not mean that he is to be restricted as to the area he is to have in cane, as he must have enough to keep him employed five days

a week all the year round. A farmer, on starting, takes an acre plants it, drains, forks, and weeds it. This will take three to four months ; he takes another acre, treats it in the same way, and keeps the first acre free of grass. At the end of eight months he should take his third acre ; the first one should then need nothing more till it is time to cut it. At the end of twelve months he has in three acres. (It is quite possible a good worker will have in four acres.) At the end of sixteen months five acres should be in and the first acre should have been reaped and worked up. This process will continue till the farmer has eight to ten acres in cane. Then he will start reaping two to two-and-a-half acres a quarter. This system spreads the work over the year and gives the farmer money each quarter, which will be a great help to him. The farmer if he studies the matter carefully, will not burn his canes (the planters burn because they can't help it), as trash buried is most valuable—acting in many ways. It adds humus to the soil ; in heavy weather it helps to drain the soil, and in dry weather it keeps moisture in the soil ; after a time it makes the soil more easily cultivated, and it also keeps down grass. Surely these advantages are enough to recompense the farmer for any trouble he may have in cutting unburnt canes.

With regard to taking up the land, a field must be taken and worked at once. Suppose it is a ten-acre field it must be given to ten farmers, five on one side of the field, and five on the other. That simplifies the digging of the drains and the cutting of the canes. If this system is adopted it allows of the field being promptly worked and reaped, which is absolutely necessary in this Colony—owing to our artificial drainage and to our system of navigation trenches.

Until a farmer has been about eighteen months on the work he is almost sure to want financial assistance, and the system I have found to work best is to advance him from time to time half the value of the work performed after it has been satisfactorily performed. This should give him quite enough to carry him on, as working for himself he should do at least 50 per cent. more work than he would do if working for the estate. If this system is strictly adhered to, it obliges the farmer

to put in a good five days' work to get enough to live on, and it leaves him a decent sum to draw when he reaps his cane. I have known farmers who had only one or two acres of land to say cane farming did not pay. How could it ? If one takes the wages that are paid for working an acre of plants, including reaping, it will be found to be $45 to $50 on to-day's rates, so it will be seen that a farmer who depends on an acre or two would be a loafer. I am assuming that he does nothing else.

With regard to the payment of canes, the more simple the system the better it suits the small farmer. I advocate giving him half the value of the sugar that his canes give. This is easy for him to follow. Say his canes give 2,000 gallons of juice at 1.5 lbs. per gallon (3,000 lbs.) Allow that the recovery is 84 per cent., then his juice will have given 2,520 lbs sugar. This is only a rough guide, but if the quotient of the purity of the juice is good the recovery would be more and this would be found on bagging off. This rate of payment must pay the farmer better than working for wages, no matter how good the wages may be.

If cane-farming can be put on a sound basis, I fail to see how it can help being of benefit to the sugar industry as a whole. I am quite aware that when sugar is at a high figure it certainly pays the estate best to grow its own canes, but can it be sure of getting the labour to do this ?

My trouble in the past has been to get the negroes, taking them as a whole of course, to earn more than they need week by week, and I do not know that they are any bettter to-day. We have to educate them to want more or in other words, to be more ambitious, and I think cane-farming will have that tendency. The better class of men will take it up, will do well, build better houses, and live more comfortably, and others will follow suit. Give it a fair trial ; if it fails then other methods can be tried. I have not often met the man who won't make money for himself if shown how to do so. We want more men of the stamp of the Rev. Eric R. O. Robertson, of this Colony, and Mr. George Wyatt, of Trinidad. These men go thoroughly into the question and are able to see both sides of a question.

FUMIGATION OF SEED WITH CARBON BISULPHIDE.

Exposure of the seed to the fumes of carbon bisulphide is the pricipal measure recommended for the destruction of pea and bean weevils. For the best results the treatment should be applied as soon as possible after the seed is ripe.

Carbon bisulphide is one of the best and cheapest fumigants at present known. It can be used to destroy almost any kind of insect that infests stored vegetable products, and, if used properly, it will not harm in any way the substance treated. Its disadvantages are that it has an evil smell, and that it gives off a highly explosive gas, but as the smell rapidly disappears and as no explosion is possible if no light is brought near, these two disadvantages are easily overcome. Its advantages are its cheap price (in normal times) and the wonderful penetrative powers of the vapour. In order to destroy the weevil grubs in peas and beans, for example, it is necessary for the fumes to penetrate through the tiny entrance holes made by the grubs and to make their way along the half-blocked tunnels inside the seeds in order to reach the grubs. Very few gases have a pentrative power equal to that of carbon bisulphide. Hydrocyanic acid gas, deadly as it is to all forms of animal life, has very little power of pentration, and is therefore of little use in treating seed in bulk.

This very power of diffusing through minute cracks and pores makes an airtight chamber essential for the successful and economical use of carbon bisulphide. Merchants who deal with large quantites of seed, meal, etc., should find it pay them to fit up a special airtight chamber for fumigation purposes, and farmers should find an airtight drum very useful. Before using a receptacle or chamber for fumigation it should be tested to see whether it is airtight or not. A small heap of dead leaves, wood shavings, or brown paper (anything that will make a dense smoke) should be placed in the chamber or receptacle, and lighted. The lid or door should then be tightly closed and a careful watch kept for small wisps of smoke. Obviously, if

smoke appears anywhere, it indicates a leak that must be stopped up before the chamber is satisfactorily tight.

Temperature is another factor that must be attended to when fumigating with carbon bisulphide. The lower the temperature the more slowly the liquid will vaporize and the longer it will take to act. Also, at low temperatures, most insects are sluggish and dormant, and the gas therefore does not have such a rapid or dealy effect on them as at a higher temperature. Hence it is advisable to choose as warm a day as possible for fumigation. At a temperature below 60 degrees F. some of the insects may escape destruction.

The gas given off by carbon hisulphide is heavier than air and diffuses downwards ; therefore the charge should be placed on top of the seed treated. Although the gas pentrates so well it should be remembered that the freer the access of the gas to all parts of the seed the more successful will be the treatment. If the seeds are in bags the bags should not be packed too tightly. They should be laid on their sides with a space of a few inches between each and the row above should be placed at right angles to those beneath ; and so on alternately. In this way the gas can circulate freely between the bags. If the seed is treated in bulk the lever should not be more than 5 feet in depth. If the depth of the seed is more than 5 feet, then a pointed iron tube with holes near the end should be thrust down into the mass for about 4 or 5 feet and part of the charge should be poured down this tube so as to reach the seed below. In the same way the liquid is sometimes introduced into the centre of bags of seed

The carbon bisulphide may be poured directly on to the seed or it may be poured into a wide, shallow dish or other absorbent material such as cotton waste or bagging. If the liquid is poured on to the seed the chamber must be closed immediately ; otherwise part of the charge will be lost into the atmosphere. If a dish is used the object should be to have as large a surface of the bisulphide exposed to the air as possible in order that it may vaporize freely and rapidly ; therefore a wide shallow dish should be used.

Four pounds of carbon bisulphide will be required for every 1,000 cubic feet of space. That is to say, if a room 10'

feet by 10 feet by 10 feet is used, 4 lb. of carbon bisulphide will be required, whether the amount of seed to be treated is 1 lb. or 1,000 lb. Apart from the manner in which the seed is stored in the chamber; the bulk of the seed treated does not affect the size of the charge required. The latter is determined by the volume of the chamber in which the fumigation takes place, therefore it is necessary to know what this is. If the chamber or receptacle is rectangular its volume is easily calculated by multiplying together the length, breadth, and height measured in feet. For example, supposing the room measures 25 feet by 10 feet by 7 feet, then its volume will be 1,750 cubic feet and the charge necessary will be 7 lb. of carbon of bisulphide.

The volume of a cylindrical drum can be computed by multiplying the area of the top by the height. The area of a circular surface is given

by the formula $\frac{22}{7} \times \frac{\text{diameter}}{2} \times \frac{\text{diameter}}{2}$ which, in a simpler form, is $\frac{11 \times \text{diameter} \times \text{diameter}}{14}$. Suppose, for example, a drum is 7 feet in diameter, and 8 feet in height, then its volume will be $\frac{11 \times 7 \times 7}{14} \times 8$ cubic feet, and this comes out to 308 cubic feet. As four pounds of carbon bisulphide are required for 1,000 cubic feet, then for 308 cubic feet only $\frac{308}{1000} \times 4$ lb or approximately $1\frac{1}{4}$ lb. will be necessary.

Failing a special airtight receptacle a barrel will make a fair substitute for fumigating small lots of seed. An ordinary twenty-five gallon barrel is about 30 inches in height by 18 inches in diameter at the top. This will just accommodate a 200-lb. bag of seed. It should be made as airtight as possible by the application of two or three coats of paint or by pasting several thickness of paper round the inside. Special attention should be paid to the joints at the bottom as carbon bisulphide vapour is heavier than air and the slightest crack left here will

entail the loss of the greater part of the gas. The cubical content of a 25-gallon barrel is about five cubic feet, and the amount of carbon bisulphide used for each charge should not be less than one fluid ounce. If any leakage is suspected a larger charge should be used. The top of the barrel should be covered with sacking or tarpaulin and weighted down during the fumigation. The cost of fumigating a 200-lb. bag of seed in this manner would, in normal times, work out to about $1\frac{1}{2}$d., and with a properly constructed chamber would be only about half this amount.

After the seed has been placed in the chamber and the charge applied the door should be tightly closed and the whole should be left for 48 hours at least. A longer exposure will do no harm, but if the chamber is opened before the 48 hours are up some of the insects may escape destruction.

Seed treated according to the above instructions is not harmed in any way. A final word of warning may not be out of place. The fumes of carbon bisulphide are poisonous and should not be inhaled more than can be helped. It is also stated by a recent American author that the fumes have a deleterious effect on the heart's action and that people with weak hearts should not handle carbon bisulphide at all. It should be added, however, that this chemical is widely used for fumigation and other purposes, yet accidents are exceedingly rare. So long as the fumes are not inhaled more than can be helped and no lights are brought near, not even a lighted pipe or cigarette, there is nothing to fear in handling bisulphide for fumigation purposes.

Bulletin No. 12.
Union of South Africa.
Dept. of Agriculture.

BITES AND STINGS.

An account of the biting and stinging powers of insects and their near relations in British Guiana.

By G. E. Bodkin, B.A., F.Z.S., F.E.S., Government Economic Biologist, British Guiana.

In British Guiana, and indeed elsewhere in the tropics, there are few objects more familiar in every day life than mosquitoes, flies, fleas and hosts of other creatures whose sole object in life appears to be the annoyance of the human race.

I propose, in this paper, to deal with the biting or stinging capabilities—these terms are synonymous to the layman—of the various classes of insects and their near relatives with which we, in British Guiana come in daily or nightly (sometimes both!) contact. At the same time I propose to give, as far as is possible, measures which may be taken to remedy, or better yet, prevent these creatures from making our lives more or less uncomfortable—the epithet does not adequately define their actions for quite a large percentage of the annual deaths in this colony can be attributed to such attacks.

TICKS.

Ticks are hardly familiar to village and city dwellers. In the bush they are well known where several species readily attack man. Their bite at first is hardly noticeable as only a slight itching is felt. Later, when the creatures commence to engorge, the irritation increases considerably and if the tick is allowed to retain its hold swelling ensues which not infrequently ends in ulceration. I have seen several cases of this. The Indians stand in great awe of one species (probably *Amblyomma americanum* L.) which they say invariably produces intense irritation and swelling. When in the bush the skin should be regularly searched for adhering ticks. When small they may be easily removed by simply pulling them off, but if at all engorged a good method is to apply a drop of kerosene oil about the mouth parts where they are inserted in the skin, in course of time this will cause the creature to loose its hold. Care should always be

exercised in removing ticks, for if the mouth parts are left in the cuticle an irritating spot will result which may continue to give trouble for several months. Gasolene, when obtainable, is quicker in its action than kerosene.

BETE ROUGE.

I come now to the most irritating animal of all—the well known Bête Rouge (*Trombidium* sp.) The happiest people in this country are those whose epidermis is proof against these little pests. I know a few such individuals and I envy them immensely. On the other hand there are quite a number of people who, when asked to go anywhere out of doors promptly enquire as to the possibilities of encountering bête rouge! The lurking place of these creatures is pre-eminently in grass, especially during damp weather. Continued dry weather almost entirely eliminates them and a lawn that is kept closely mown harbours but few.

The cattle pastures throughout the coast lands and in fact grass pretty well all over the colony—I have no experience of the savannahs—are the home of these minute, crimson coloured abominations. If your cuticle is sensitive don't walk about on grass land without taking precautions which I propose to detail shortly. A few hours afterwards and, more especially, when you retire at night, you will have a very real cause to regret it. There is no intenser or malignant itching throughout the whole category of irritations caused by insects or their near relatives. I could enlarge on this statement, mention cases of blood poisoning and nervous exhaustion all brought about by this pest which is hardly visible to the human eye. The chigger whilst maturing produces a not unpleasant, slow kind of irritation, which causes one to scratch or 'dig' (to use a Creole word) the bite of a flea is sharp and yields no lasting itch, the mosquito is more or less the same but the bête rouge itches for days and days and even longer.

Bête rouge in the bush are infinitely more virulent than their coast land brethren; I speak from bitter experience.

I have times out of number been asked to suggest a cure for bête rouge. The only answer to this question is that

there is *no real cure* ; one can only *prevent*. I have tried all the cures myself; none are efficient.

To prevent bête rouge is, perhaps, a troublesome and messy business but it is worth while ; those who suffer from the pest will agree with me.

If it is proposed to traverse grass land which is suspected of harbouring these creatures the following preparation may be made. From the feet upwards to just above the knee must be copiously smeared or rubbed with any of the following—any kind of soap, crab oil, vaseline, in fact any kind of good grease. Strong smelling substances are often volatile and their efficacy is reduced after a few hours. Thick grease or soap effectively prevents the bête rouge from crawling on, or penetrating, the skin and he has to depart hungry and disconsolate or else get arrested and killed in the grease.

If it is neither possible or convenient to protect oneself by the above method a change of clothing accompanied by a thorough bath will, if performed within two hours after exposure, prove equally efficacious. The wearing of well fitting puttees excludes these pests fairly effectively for some hours but they gradually find their way through the cloth.

Grass lawns and plots to which poultry have access are always well provided with these minute creatures, this is apparently due to the fact that the fowls are favourite hosts and consequently an excellent medium for the multiplication of the pest.

There is a popular idea that the crimson colour of the bête rouge is due to ingested blood. This is a fallacy. The crimson colour is natural and, as far as I can ascertain, the creature never sucks blood at all but, making its own way down into a sweat pore gradually dies in this position (for it is an unnatural one). Its presence within the pore however causes intense pruritus.

COWFLIES.

We now come to our winged friends (?) such as cowflies, mosquitoes, marabuntas, sand flies, and we may also include the hairy worms as they are the undeveloped stage of a butterfly and perhaps the ants as they are blood relations to the marabuntas.

It is almost an unusual occurrence for a cowfly to bite a human being. This is probably due to the fact that the appearance of these insects is generally the reverse of silent and the would-be host is consequently warned. Certain members of the genus *Chrysops*, however, have a peculiarly silent flight, thus the fly known as *Chrysops trisis F.* which occurs commonly in the Botanic Gardens will often alight on ones neck—preferably on the back thereof—and proclaim its presence by the painful introduction into the cuticle of its proboscis. It is also a shade loving fly and prefers the morning and evening hours.

Two small species of Tabanids (*Diachlorus scutellatus* Mcq. and *D. curvipes* Fab.) which at certain times of the year, occur commonly in the North West District assume an exceedingly direct and persistent mode of attack on human beings. These insects have no particular choice as to the time of day for their activities.

In this district a species of Pangonia (*Dicaranomyia cervus* Wied) occurs which attacks human beings. I recollect on one occasion watching a party of men who were occupied in cleaning away tall grass from an area under rubber cultivation. The men were bending to their work when one of them made a convulsive movement, and straightened his body ; at the same time striking at some object in the air with his hat. The blow was successful and knowing that I was interested in such matters, he brought the victim to me. It was one of these previously mentioned *Pangonia's* which had apparently made a silent approach and, alighting, had proceeded to use its proboscis on a certain tender portion of the man's anatomy over which his clothes were tightly stretched ! I was informed that this was a frequent occurrence.

MOSQUITOES.

So much for the cowflies ; we come now to our constant companions the mosquitoes. I do not propose to go much into detail here but to only make a few general observations on the biting propensities of these pests.

Everyone in this country has not alternative other than to be on terms of intimate association with the mosquito. There are no objects of greater familiarity in our daily lives. Only a

few observant people, however, could tell you that it is often possible to tell what particular kind of mosquito is attacking simply by the irritation set up by the bite itself or the after effects.

The well-known house mosquito (*Aedes argenteus Poiret*) is a cautious insect in attack, probably from long experience of the powers of retaliation with which mankind is possessed. It is seldom that any pain is experienced when this insect commences to bite ; it is the powerful irritation set up by the bite that is so objectionable. This particular mosquito has a steathly, round about method of approach, performed, if possible, under cover. Thus the ankles are a favourite location, especially when one is seated at a table with the feet in deep shadow. The intense irritation set up by the bite of this mosquito is characteristic.

The Anopheles is bold, often too bold. It approaches with an almost silent flight and proceeds at once with the work in hand, i.e. to get a feed. The bite is painful—almost akin to the introduction of the point of a sharp needle into the flesh. This sharp painful bite is characteristic. Little, if any after irritation is felt.

To take a further and final example of how the particular kind of mosquito may be known by its mode of attack the large bush mosquito may be given. The species known as *Mansonia tittilans* Theo. which is a common species in the coast land "bush" is as clumsy by comparison with the house mosquito as an old witch bird is in flight with a swallow. This bush mosquito usually arrives on one's hand or other exposed portion of the integument in such a hurry to feed that it appears utterly unconscious of any danger. It has also a noisy flight and the pain of its bite is quite out of keeping with its size.

CHIGGERS AND FLEAS.

The chiggers and fleas come next in our category. I need say little about chiggers. The irritation which they cause in the latter stages of their development can be intense and if neglected in any way dangerous complications may arise. I have heard several people state that the slow itch set up by the chigger in the early stages of its development is not at all unpleasant.

Little need be said about the ordinary flea (*Pulex irritans* Linn.). This creature is always extraordinarily common about Indian camps even in the far interior and it is always wise to sling one's hammock high enough from the ground so as to be out of reach of the jumping capabilities of these creatures. In such localities the bite of the flea causes far greater irritation than its congener of the coastlands. This is a curious but true fact.

Lice we need not discuss. The black creoles of the colony appear to enjoy the irritation set up by the crab louse (*Pthirius pubis* L.) for one not infrequently hears such alluded to as 'a sweet itch.'

CATERPILLARS.

There are a variety of caterpillars in this country which are adorned with formidable arrangements of spines possessed of urticating qualities.

In this respect none can excel the larva of the Limacodid moth *Sibine fusca* Stoll. It is an inconspicuous creature and has a habit of taking up a position on the under surface of a leaf. If any part of ones skin comes in contact with the spines of this caterpillar a terrible irritation is set up which is more pronounced on those with tender skins or if scratching is indulged in. A solution of ammonia and water gently dabbed on to the affected parts will greatly reduce the pain. A number of other larvae of the same family enjoy similar properties.

BEES, ANTS AND WASPS.

Bees, ants and wasps, known collectively as Hymenoptera, are famous for their powers of stinging and in this country some of the larger forms of these three classes are capable of inflicting a sting whose effects are literally dangerous.

Some of the larger bees such as *Xylocopa fimbriata F.* the large wood boring bee, *Euglossa cayennensis,* St. Farg, and *Euglossa dimidiata F.* are furnished with formidable stings, while a large Pompilid wasp such as *Pepsis terminata* Dahlb, or *Pepsis frivaldskyi* Mocs. could inflict a sting which might result in temporary paralysis of the affected part.

The common brown marabunta or wasp known scientifically as *Polistes canadensis* L. var *amazonicus Schulz* can give

a most painful sting and owing to its habit of nestling in galleries of houses, under railway platforms, steamer, stellings, and privy seats it quite frequently finds opportunities and cause for utilizing this means of recording its resentment. I have seen a man who has been stung on the lip by this wasp to become almost unrecognisble owing to the immense inflamation which took place.

The so-called 'saucepan marabunta' *Apoica pallida Oliv* (thus termed because of the similitude of the shape of its nest to the lid of a saucepan) can inflict a particularly virulent sting.

The apterous (wingless) females of the Mutillid wasps possess very effective stings to which I can personally testify.

Members of the tribe of small bees known scietifically as *Melipona* possess no stings but attack an intruder or any person who disturbs their nests by alighting on the exposed parts of the head and neck and biting sharply. I have several distinctly unpleasant recollections of being thus attacked.

It is a common expression that the bite of such-and-such insect will 'give you fever.' It should be explained here that the 'fever' is brought about by the shock and pain of the bite bringing on malaria (as indeed any sudden shock will in individuals susceptible to this disease.)

Stings of wasps and bees and the inflamation caused thereby can be very successfully dealt with by applying some of the 'blue' used by washer-women. It is an ancient but excellent remedy.

Many of our ants sting and many bite ; not a few "use both ends." The tiny little red ant which commonly infests human habitation known to science as *Solenopsis corticalis* For. subsp. *amazonensis* For. can inflict no mean sting while the large 'Munir' (*Parapanera clavata F.*) is much dreaded as its bite invariably brings on fever. A very common ant which nips with its jaws whilst inserting its sting is the red ant of the coast lands known as *Tetramorium guineense* F; the sting causes intense irritation. The biting powers of the large Coushi ant *Atta sephalotes* L. causes blood to flow freely.

BEETLES, BUGS, CENTIPEDES AND SCORPIONS.

With regard to the beetles or Coleoptera none of them rejoice in the power of stinging but most of the larger forms can

bite quite severely, notably some of the larger long-horned or Cerambycid beetles.

Amongst the true bugs (known as Rhynchota) we may, in passing, mention the well known bed bug with whose bite many of us are far too familiar.

Another member of this family which does not hesitate to use its mouth parts, though in this particular instance in defence, is an insect known as *Sirthena strid* F. This creature is readily attracted to artificial light and if an attempt is made to grasp it with the hand the proboscis is driven into the offending finger to a considerable depth which causes pain and subsequent swelling.

Centipedes, at least the common large species, are supposed to possess a peculiarly poisonous bite but I have had no experience thereof.

Scorpions are plentiful though I have never come into personal personal contact with anyone who has been stung. Certain people are supposed to be immune from their stings.

SANDFLIES.

The sandflies, which I should have mentioned earlier, possess no mean powers of biting. A curious feature which I have frequently observed about the effects of these creatures bite is the tremendous swelling which it occasions on some individuals whilst on others the only trace of the attack is a tiny red spot. The coast land sandflies with which I am personally acquainted have an exceedingly sharp bite not unlike that of an Anopheles mosquito. In certain parts of the coastlands they render existence almost impossible. A true saying is that "when the mosquitoes go out the sandflies come in." Certain species which occur on the far hinterland savannahs are notorious ; of these, however, I have no experience.

LIBRARY
TNAU, Coimbatore - 3
000001328

NOTES ON A COLLECTION OF PRESERVED DRY FRUITS AND SEEDS. (Continued)

BY J. F. WABY

"Wallaba," *Eperua falcata*, indigenous, known also under the names, Bainha de Espoda, Bemiti-Wallaba, Eperu, Karbiti-Wallabâ, Parima, Sara-bebe, Shingle-wood, Itooni-Wallaba Wapà, Wapa-Muileux, Wapa-Patouma, Vouapa-tabac. The fruit of this is a dark brown pod, scimitar shaped, 9-11 inches long, 3 inches wide, containing 2-3 large seeds, which are plainly visible bulging in the pod. Dehiscence takes place as soon as the pods are quite dry and the seeds are ejected. A tall tree with spreading branches; foliage pinnate, 4-5 pairs leaflets elliptical, pointed, 4-5 inches long, 1¾ inches wide; the inflorescence springs from among the foilage in strings 2-3 feet long, a few small reddish flowers on each in verticils, producing one or two pods. It is an exceedingly useful tree, producing wallaba posts, shingles, and firewood. It does not succed near the sea-bord, but is extensively found up the rivers growing quite down to the water's edge. My specimens were brought from the Demerara River.

"Water Wallaba," *E. Schomburghii*, indigenous. The pods are similar to the ordinary wallaba, but smaller being 8-9 inches long, and 2½ inches wide, producing one or two large seeds, dehiscing when ripe. The growth of the tree is more compact than the foregoing, with rather larger pinnate foliage; the inflorescence in short strings with a few pale greenish flowers. This species will grow near the sea-bord and makes a handsome specimen. Specimen fruits obtained in the Botanic Gardens here.

"Ituri-Wallaba," *Eperua Jenmani*, (*Parivoa grandiflora*). The fruit of this is shorter and broader than the others, 6 inches long, 4-4½ inches wide, with one or two large seeds, dehiscing as soon as ripe, ejecting the seeds. This tree makes a handsome specimen with drooping branches, and will thrive in town. Foliage pinnate, pale green, 4 pairs of leaflets, similar in form to those of the wallaba. The inflorescence is one of the most

beautiful of our flowering trees, of an intense purplish-blue colour, in large rounded racemes, the individual flowers large and orchid-like. Specimens from Georgetown.

Banhinia Vahlii, indigenous. The fruits (pods) are 9-10 inches long, 2½ inches wide, covered with a brown velvetey tomentum, flat, carrying 3-4 seeds. A strong growing climber with large pale-green foliage, which, like that of all the Banhinias is double, the two halves hinged in the middle, with 5 prominent veins on each half. The flowers are handsome in large round racemes of a pretty cream and yellow combination of colours. Specimens from the Botanic Gardens.

The "Devil's Ear," *Enterrolobium cyclocapum*, indigenous. The fruits of this are peculiar, shaped somewhat like a large ear, forming a circle ; some flat and others tortuous and twisted, dark brown, polished ; the sinus circular, small, the ends almost or quite meeting in the centre ; outer edge sinuate ; the seeds, about 8 or 9, forming protruberances in the pod ; indehiscent, the substance of the pod being rather thin decays easily and allows the seeds to germinate readily. A lofty tree with whitish, smooth bark, large stem and strong upstanding branches; foliage bipinnate with tiny leaflets; Inflorescence, a terminal panicle with small whitish-green flowers. The seeds are oval in shape dark brown with a pale brownish shield on both sides. They make pretty ornaments taking a high polish. Specimens obtained in the Botanic Gardens.

The "Oreille Mallatre," "Mullato's Ear," *Enterrolobium Timbonoa*, Trinidad. The fruits of this are also dark polished brown and very tortuous, outer edges crenate ; the sinus open and only partly circular, frequently with a decided ear-lobe at the basal end ; indehiscent, easily decaying to allow the seeds to germinate. A large forest tree with a very stout stem, dark rough bark, and a wide spreading head. Foliage and inflorescence similar to the previous species. Specimens obtained in Trinidad.

The "Nicker-bean," *Caesalpinia* (*Suilanding*) *Bonducella*, cosmopolitan in the Tropics. The pods are borne in large branches, kidney-shaped, 3 inches long and 1½ inches wide, thick, of a strong papery substance, covered with sharp brown

spines $\frac{1}{4}$ inch long. Dehiscent in two valves. The seeds are like stone marbles, $\frac{3}{4}$ inch in diameter, gray or lead combined. The plant is a very strong climber, every part of it covered with sharp brown spines. Foliage large, bipinnate ; leaflets rather small. Inflorescence a strong panicle with bright yellow small flowers. The seeds have been used in the early stages of dropsy, being roasted and powdered, and taken in decoction. Specimens from the Botanic Gardens.

Macrolobium acaciaefolium, indigenous. "Brown Biscuit" pod. These fruits are flattish, dark brown, hard, smooth, oval in shape, $2\frac{3}{4}$ inches long, $1\frac{3}{4}$ inches wide, one seeded, indehiscent, decaying on the ground to permit of germination. The tree is fairly large, growing, with handsome, pale green, bipinnate foliage, leaflets, very small ; the flowers are small and insignificant, axillary ; the pods borne singly. Specimens from Botanic Gardens.

Macrolobium hymaenoides, indigenous. The fruits of this are flat, dark brown, one or two seeded, rhomboid in shape, 3-4 inches long, 2 inches wide, of hard texture, veins running all over in all directions, the ventral siture wide and prominent, indehiscent. The tree is of medium size, with dark foliage similar to that of the locust tree in pairs, unequal sided, does not grow well near the sea-bord. Specimens from Botanic Gardens.

The "Sappan Dye-Wood" tree, *Caesalpinia Sappan* of the East Indies. The fruits are borne in large bunches ; individual pods $2\frac{1}{2}$-$2\frac{3}{4}$ inches long, $1\frac{1}{2}$ inches wide, with a decided point and oblique base, veins quite plain, of a hard woody substance, indehiscent. Seeds 4 or 5, quite hard, dark brown. A small tree with dark, bipinnate foliage, fairly large, leaflets small. Inflorescence a large panicle with small bright yellow flowers. The wood is of a dark blood-red colour, used as a dye material. Specimens from Berbice Gardens.

"Brasiletto," *Peltophorium ferrugineum*, of the East Indies. Pods thin, 3-4 inches long, rather less than an inch wide, with sharp edges, 2 distinct longitudinal marks, fine veining running between ; indehiscent but decaying easily being of a thin texture; 3-4 seeds. The tree is large growing, of handsome form, with dark bipinnate foliage ; inflorescence in large panicles with brown

and yellow flowers, a beautiful sight when in full bloom. The bark is rough and the wood of a dark reddish colour. Specimens from Promenade Gardens.

"Brasilette," *Caesalpinia bijuga*. A West Indian tree. The pods of this are more substantial than in the foregoing species, 3-3½ inches long, ¾ inch wide. and ⅜ inch thick, hard. dull brown, edges much paler than the rest ; compartments well marked showing 8 or 9 small seeds, indehiscent. The tree is of medium size, of very hard wood, this bark which is constantly peeling in patches. Foliage small, bipinnate in few pairs, leaflets very smooth. also in pairs. Inflorescence in short racemes, flowers yellowish. Specimens from Botanic Gardens.

"Brasilette," *Caesalpinia ferea*. This tree is similar to the last named, of rather larger growth and larger fruits. Pods 3-3½ inches long. 1¼-1½ inches wide, ¼ inch thick. of quite a hard texture, dark brown, smooth, with a sharp point. Seeds 4-5. Specimens from Botanic Gardens.

"Spanish Ash," "Bitchwood," "Dogwood," "Fish Poison." *Piscidia Erythina*, West Indian. This bean is of quite papery texture, brownish yellow, compressed, with 4 longitudinal wings which are closely marked transversely, edges toothed, 3½ inches long, 1½ inches wide, the centre only occupied by 5 or 6 small brown seeds, taking a space of little more than ¼ inch wide, in separate compartments, indehiscent, but decaying rapidly on account of the nature of the pod. The tree is small, upright, spreading little ; foliage pinnate with few pairs of oblong leaflets, the inflorescence in compound racemes, flowers small, whitish, tinged purple. Beans in bunches. Specimens from Botanic Gardens.

"Gum Arabic" tree. *Acacia arabica* of the East Indies. The bean of this is a "somentum" with deep constrictions almost dividing it between the seeds, dark brown, thin, 3-4 inches long, rather more than ½ inch wide across the seeds, these 5-6, small, dark brown, oval, with a circle near the margin. Dehiscent when quite dry, ejecting the seeds. A medium sized tree with a good head of close, thorny branches; foliage pinnate with very fine leaflets. Inflorescence in small racemes ; flowers yellow like tiny balls. Specimens from Botanic Gardens.

The "Dattock," "Taura," *Detarium senegalense* of Tropical Africa. The fruit of this is fleshy, rounded, gray, ripening brown, indehiscent, one-seeded. The fleshy covering decays and exhibits a mass of greenish mealy substance, which when dry falls away, leaving a close network of strong fibre like filigree work, covering both sides of the seed case ; the ventral suture is very wide standing like a broad flat ridge. The seed case with its filigree covering is 1½ inches long and wide, 1 inch thick : as the case is very hard it takes a long time under moist considitions for germination to take place. The tree is rather large growing, with gray stem and strong branches, spreading out into a large umbrella-shaped head, sometimes the branches occur very low, spreading at once from just above the ground. Foliage pinnate in 5½ to 6 pairs ; leaflets, sometimes regular, at others irregular, oval, mucronate glaucous beneath, dark green above, 2½ inches long, 1¼ inches wide, with close ; plain veins. Inflorescence in short corymbs with very small greenish white flowers. Specimens from Botanic Gardens and Trinidad.

The "Hop-flower," *Flemingia strobilifera*, from the East Indies, naturalized in the West Indies. The inflorescence of this is in large compound racemes composed of continuous papery strobils, which are kidney shaped, folded distichous bracts, which present a striking object in ripening, the strobils turning a light brown colour with the end ones green. Flowers very small. The very small beans, ½ inch long, rounded, are concealed within the strobils, and are dehiscent. The general foliage is entire, elliptical, 6½ inches long, and 3½ inches wide, veins prominent beneath, but those among the inflorescence are about half the size. A shrub 4-6 feet high and about the same spread. Specimens from the Botanic Gardens. Very common in Trinidad.

"Moon-fruit," "Sickle-pod," "Wait a bit," "Bindooree" "Brandoom" "Branti-maka" *Drepanocarpus limatus*, West Africa. The bean in some cases is quite circular, the sinus having just a slit between stalk and point, in others the opening is much wider, but in any case the names "moon-frut," or "sickle-pod" are appropriate as these forms are well carried out. The term "wait-a-bit" is an allusion to the re-

curved sharp thorns on all its branches which are difficult to get away from when once entangled with them. The beans are $1\frac{1}{4}$ $1\frac{1}{2}$ inches wide in the widest part, and $1\frac{1}{4}$ inches in the narrowest, quite flat, thin, leathery, one-seeded, indehiscent, easily decaying. A large scrambling shrub with strong recurved woody spines on the branches growing in swampy places affected by salt water. Foliage small, pinnate with alternate leaflets, $1\frac{1}{2}$ inches long, narrow. Inflorescence in small compound racemes; flowers small, violet coloured.

" Bead tree," " Lucky bead," " John Crow " tree, *Ormosia dasycarpa* of the West Indies and Guiana. The bean is small, $1\frac{3}{4}$ inches long with a beak, 1 inch or a little more wide, 1 inch thick, hard, dark brown, dehiscent, one-seeded. A large timber tree with a well formed head of close branches. Foliage pinnate with 5 pairs of leaflets, these 3-4 inches long, $1\frac{1}{2}$-2 inches wide. Inflorescence a small terminal panicle, flowers small, blue, seeds rounded, compressed, $\frac{5}{8}$ inch long, $\frac{1}{2}$ inch wide, $\frac{3}{8}$ inch thick, bright red with a large black blotch.

" Baracara," *Ormosia cocoinea*, a second species belonging to Guiana. The seeds are similar to the foregoing but smaller, the red colouring of a paler shade. Seeds of these two species were sent me from the North West District.

" Anchor seeds," *Ormosia jamaicensis*, I have only the seeds of this which were sent me from Jamaica by Mr. Harris of the Botanical Department who discovered the species. Seeds distinctly larger than in the other two species, $\frac{3}{4}$ inch long, and wide, $\frac{1}{2}$ inch thick, some a trifle smaller, bright red, many of them with a distinct black anchor, others with parts of an anchor, some with one fluke on the standard, some with the standard alone, but none with the irregular large blotch as in the other two species.

"Divi-divi," "Libi-dibi *Caesalpina (Lebi-divia) coriata* of the West Indies. These are very curious beans, assuming many shapes, 2 inches long (many less) $\frac{3}{4}$ inch wide, flattish, curved in-and-out, some quite circular, leathery, dark brown, small seeds; separated in the bean by tissue indehiscent but easily decaying. The tree is small growing, with long, straggling, irregular branches ; foliage bipinnate with many small leaflets in

pairs. Inflorescence ni contracted, compound racemes, flowers greenish white. The beans are used for tanning purposes. Specimens from Botanic Gardens.

"Copahn," "Copabia-balsam," "Lapatero," "Mara" "Mutlich," **"Mumeri-rana"** "Purple heart" "Purpumhart." *Copaifera officinalis* of the West Indies.

The fruits are almost circular, flat, thin, leathery, dark brown, one-seeded, the impression of the seed plain, brownish gummy spots exude from the bean case. A high tree with a pale brown stem and a spreading head. Foliage pinnate, 3½-4 pairs of leaflets, these dotted, 2 inches long 1¼ inches wide, oblong pointed, unequal sided. Inflorescence in small terminal and auxillary racemes, flowers small, whitish. The wood is hard, of a dark purple colour, valuable for carpentry, balsam in the form of gum is extracted from the living tree. Fruit specimens from Trinidad.

"Balsam of Peru," *Myrospermum Pereirae*, of Peru. The bean a knob with a thin falcate papery wing 3½-4 inches long, ¾ inch wide, sides unequal, a distinct marking up the centre; the seeds at the base in a rougish ball-like proturberance, two in number, whitish, rather soft of a nut-like substance, like a short thick hook with a blunt end, the ends contiguous, wrapped in a pithy case surrounded by gum balsam. A large spreading tree with whitish stem and branches; foliage pinnate, dark green leaflets irregular of about 6 pairs oblong, 2½-3 inches long, 1¼ to 1½ inches wide. Inflorescence in axillary racemes, plentiful; flowers verv small, whitish. Specimens Trinidad.

"Cowitch," "Horse-eye" seeds. *Mucuna urens*, West Indies and Guiana to Brazil and Peru. The bean 5-6 inches long, 1¾ inches wide, 1 inch thick, black, leathery, with sutures shortly winged with numerous transverse short crests on both sides covered with short stinging hairs. Seeds 3 or 4, rounded, compressed, ⅜ inch wide, ⅝ inch thick, nearly surrounded by a broad band; the raphe, kid black in colour with a greenish stripe on each side. The plant is a strong climber with 3-foliolate foliage leaflets fairly large, inflorescence in large fascicles, flowers large, yellow, forming large rounded bunches in profusion. I may be permitted to

mention my introduction to this plant some 43 years ago. It was in Trinidad ; I was visiting a place called Toco on the north side of the Island, and stayed at the Police Station. On my first afternoon just before dusk I took a walk into the bush and the first strange thing I saw was a bunch of 5 or 6 fruits hanging within reach which I firmly clutched and pulled down.

I had little sleep that night, for my hands, arms, face and neck were smothered with stinging hairs with which my beans had been covered and it took a lot of scrubbing to dislodge them. The men at the station told me what these beans were so my knowledge was increased in more ways than one. I had the satisfaction however of having secured a quantity of the seeds from which I made later a pair of handsome bracelets for my wife. Although in later years I grew a splendid plant of this at the Botanic Gardens which was greatly admired by everyone my specimens, both seeds and fruit, came from Essequibo, sent by the Revd. W. Nicholls.

"Cow or ox-eye" seeds. *M. pruriens*. I have a few seeds of this second species of which I have not seen the plant, but there is little difference between the two species, except that the flowers are of a dark blue or purple colour and the beans have no transverse crests ; the hairs are there however as in all Mucuna's. The seeds are larger than those of the "Horse-eye," of a dark brown where that is black and the circular mark near the raphe pale brown instead of green.

I have seeds of a third species, *M. Fawcettii*, discovered by Mr. Harris of the Jamaica Botanic Department and sent to me by him. I have no description of the plant, but the seeds are very much larger than those of the other species, though similar in detail : $1\frac{1}{2}$ inches long and similar in width, $\frac{3}{4}$ inch thick, kid black with a broad black raphe, and a pale brown circle each side the raphe.

T. The "Florida Velvet bean" *Stizofolium aterrimum*. It has also been known as *Mucuna pruriens var utilis*. This seems to be identical with a species we had many years ago under the name of *Carpopogon purpureum*.

The beans falcate, leathery, covered with minute hairs, 4-$4\frac{1}{2}$ inches long, $\frac{3}{4}$ inch wide, $\frac{1}{2}$ inch thick, both sutures plainly

marked, a longitudinal ridge on each side, the bulging of the 5 or 6 seeds very plain, each in a separate compartment, shining black, with a whitish raphe, oblong $\frac{5}{8}$ nich long and thick.

This is a strong twining plant with 3-foliolate foliage and dark purple flowers in long racemes. It was imported as a cover plant to be dug in for improvement of the soil. The beans are indehiscent but would easily decay; when thoroughly dry they break open easily by pounding. If the seeds were innocuous, on account of their prolific character and substance a splendid meal for consumption could be made after the black skin were eliminated.

"Circassian bead," "Red Sandalwood" "Lady Coot," *Ademanthera Pavonina,* introduced from the East Indies, naturalized in the West Indies. (Seed specimens only.) The beans are narrow ; compressed, slightly falcate, 6-9 inches long pale brown, containing many seeds freely dehiscent, the dehisced beans and seeds often clinging to the tree till the branch breaks. Seeds of a very bright shining red, very hard, biconvex with a sharp edge $\frac{3}{8}$ inch broad both ways $\frac{1}{4}$ inch thick. A large tree with a well shaped head; foliage bipinnate spreading, with many pairs of leaflets these about an inch long, oblong pale green. Inflorescence a large panicle; flowers small, yellowish white.

The wood is reddish. Specimens from the Botanic Gardens. In spite of the difficulty of piercing one often sees necklaces made with the seeds.

" Coral bean," " Red bean," " Jumbee bead," " Erythrine-graine de corail." "Immortelle," *Erythrina corallodendron*. West Indian. The bean narrow, constructed, beaked, 6-7 inches long, many seeded, pale brown easily dehiscent, the seeds often hang on the valves a long time. Seeds small $3\frac{1}{4}$ inch each way, $\frac{1}{4}$ inch thick, shining scarlet with a black spot like a saddle straddling it. A small tree with rough bark, prickly ; foliage 3 foliolate leaflets ovate rhomboid ; flowers pale red in short spikes. Seed specimens from Botanic Gardens. The plant known under the same name in Trinidad is similar in every respect except the seeds; these, instead of having a black blotch like a saddle, have a round black spot on the end.

"Dadap," "Pangara," "Phulcana," "Muchie-wood," *Erythrina indica*, introduced from the East Indies, naturalized in the West Indies. The bean 5-6 inches long, as thick as the finger, constricted, leathery, easily dehiscent, 6 or 7 seeded. Seeds blackish purple with a depressed hilum, $\frac{1}{2}$ inch long, $\frac{3}{8}$ inch thick, oval with blunt ends. A stout soft-wooded tree with stout branches; foliage 3 foliolate, leaflets ovate rhomboid, large; flowers in terminal racemes, bright scarlet. The wood is useless as timber. Seeds from the town trees.

"Goa bean," "Square bean," "Sequidilla," "Winged bean," *Psophocarpus tetagonolobus*, from the East Indies. The bean is peculiar in possessing 4 longitudinal rings, of a brittle woody substance, brown, 9-12 inches long, over an inch wide with the spread of the wings the centre portion containing the seeds $\frac{1}{2}$ inch square, a wing to each corner, these often reflexed. The sutures plainly marked. The seeds 12-18, in separate compartments, pale brown darkening with age, with a short hilum, almost round, $\frac{3}{8}$ inch thick. This is a twining climber with 3-foliolate foliage leaflets ovate, pointed; inflorescence in long-stalked few-flowered auxillary racemes; flowers large, blue, exactly like sweet-pea flowers. The young beans, taken before the fibre is formed when about half grown, are a splendid green vegetable cut up and used as French beans, tasting much like young green cabbage. The seeds should be useful as a meal or coarse flour. Specimens grown by myself.

"East African"—Zanzibar—or "Sun Copal," "Copal Resin," "Sum Anime," *Trachylobium Hornemannianum*, of South Africa. The beans hard, dark brown, oblong, 1$\frac{1}{2}$ inches long, 1 inch wide, $\frac{3}{4}$ inch thick, verrucose with a number of cistes filled with a white resinous matter which is readily inflammable, indehiscent, one or two seeded. Seeds hard, oblong, dark brown, $\frac{5}{8}$ inch by $\frac{1}{2}$ inch, $\frac{3}{8}$ inch thick, smooth. Foliage like that of the West Indian Locust in twin-pairs, unequal sided. Obliquely oblong. Inflorescence in terminal flattish panicles; flowers small yellowish. A large tree with hard wood. Specimens from the Botanic Gardens.

BOTANICAL NOTES.

SOME INTERESTING SPECIES OF PALMS.

Mauritia Flexuosa, the "Ita," or "Aeta" palm of Guiana and the "Moritch" of Trinidad. A swamp palm, growing to a considerable height, with stout stem and fairly large head of ragged-looking, large, fan-shaped leaves, the segments cut nearly down to the centre of the leaf ; leaf-stalks very stout. The plant is diœcious and like all other palms of this character the sexes are indistinguishable till the spadices are produced ; these are formed below the leaves and not among them as in the case of the *Latania* and *Borassus*. In both sexes they are large and heavy with simple, pendant, rope-like branches ; the females bear a very large number of reddish-brown fruits, 1½-2 inches in diameter, indented at top, the covering marked all over with a small imbricated scales. The male flowers are yellow, borne on innumerable catkins. Both inflorescences are beautiful objects. A useful strong twine called "Tibiseri" is made from the leaves and the seeds contain oil. We have not heard of wine being made here or in Trinidad from the young spadices as is done with many of the Eastern palms, but undoubtedly these could be utilized for that purpose.

Chrysolidocarpus lutescens, the "Sugar Cane" palm, from Mauritius and Bourbon Islands, the sole species. This is one of the most effective palms for decorative work whether in the garden or as a pot or tub plant, with quite a distinctively charming character. It forms large clumps of close growing stems, keeping well furnished with young shoots at the base for many years so that the plant is a succession of stems of different lengths, each with a small head of leaves, making a dense mass of foliage, 10-12 feet through, and as much, or rather more in height. The name "Sugar Cane" palm is given to it on account of its resemblance of the stems to the Sugar Cane ; these are about 3 inches in diameter, closely jointed, now and then some of them are forked at the base, a rare occurrence in palms The leaves, some 4-5 feet long, are gracefully arched with narrow leaflets about 12 inches long, leaf-stalks and ribs yellow, a pretty con-

trast to the pale green colour of the foliage. The spadices are borne below the leaves, arched and drooping, much branched, the branches with the flowers open appear like Willow Catkins the flowers small, monoecious, side by side, the fruit small, oblong ; the whole spadix of a yellowish colour.

Cystostachys Renda, the "Sealing-Wax" palm, or "Malawain," of the Malay Archipelago. This is an elegant decorative plant distinguished by the brilliant red colour of its clasping leaf-bases and midrib of the leaves, contrasting conspicuously with the dark green colour of the foliage and the dark mottled green of the base stems. It forms a compact group extending all round by means of suckers. It does not seem to be of any particular use, but its unique appearance is very striking. The leaves are 6-8 feet long including the stalk, semi-erect ; leaflets 15 inches long, 1½ inches wide, in regular order. The spadices are borne below the leaves with simple branches 12-18 inches long, strong, pendant. The flowers are very small, monoecious on the same spadix close together. The fruit small, elliptical.

Desmoncus, the "Koomawarrie," "Wait-a-bit" or "Croque-Chien." There are several species of this genus, all spoken of under the same local names and all very similar in character, though differing in strength of growth and size of foliage. They are strong climbing palms of the West Indies and Tropical America comparable with the "Rattans" of the East. They are not palms to be used as pot-plants for decorative purposes even in their young state, the thorny appendages of the leaves prevent their use as such, but planted at the base of high trees they will climb to the very top. In the forests they are often to be met with and woe betide the unlucky man who becomes entangled by them ! he will find that he has indeed to "wait-a-bit" before he gets free and will be lucky if he gets away with all his clothes. They grow with long climbing shoots well furnished with leaves which have long clasping bases losing the lower leaves as they climb and expose a long cane for each shoot, large or small in diameter according to the species, though no more than an inch thick. The leaves are pinnate of 2-3 or 4 pairs of pinnoe, each leaf terminating with the continuation of the midrib, carrying several pairs of reflexed, large, sharp

thorns 2-3 inches long, which assist the shoots in climbing as they hang on to stems or branches wherever they touch. The spadices are rather small, borne among the leaves, monoecious on the small spadix; the fruit small, bright-red. In the bush the bare canes are to be found in great lengths, sometimes running along the ground to a considerable length before mounting ; these could undoubtedly be utilized the same as the small Rattans are, i.e., for seating chairs and any work for which small canes are needed. *D. Major* gives a cane similar in size to a Malacca cane, and *D. polyacanthos* one of a much smaller size.

Nipa fruticans. This is a stemless, aquatic plant more closely allied to the Pandana's than the palms, though its general appearance is quite palm-like. It is interesting as being the only really aquatic palm-like plant we have, though several of our palms are swamp plants, none are altogether aquatic as this plant. It comes from the tropical estuaries of the Sunderbunds, where it forms large groups by extending from its centre by suckers, wide apart, each separate plant with several large leaves direct from the surface of the water, 20-30 feet long like huge feathers with broad leaflets, 5-6 feet long, drooping gracefully. It is monoecious in its flowering, the sexes on separate spadices, i.e., on the same plant arising out of the water inside the broad leaf-bases. The male spadices 6-7 feet long, more than half being stem; several short, strong branches bearing the flowers in catkins, 3 inches long, yellow, strongly perfumed. The female flowers are borne in a large terminal head, the head being an aggregation of many fruits closely packed together in a mass 1 foot in diameter, each perfect fruit 3 x 3 inches thick, flattened, with sharp edges, the outside or case of the fruit being a mass of fibre. It is said that an inferior kind of palm wine is made from the powdered spadices, and that it is a sugar producing plant. Many years ago some of our estates authorities wished to test the value of this plant for producing sugar, applications were received and seeds supplied, but no results as far as I know were ever heard of. It was introduced here in 1884 ; a case of germinating seeds were received from Calcutta, 18 of these were established on the edge of No. 2 Lake in the Botanic

Gardens and subsequently transplanted to suitable positions. The descriptions given here were taken from the plants growing in the Gardens. It is very subject to the attacks of scale insects and many of the handsome groups of this plant in the various Lakes have been completely destroyed in consequence, but when taken in time, before the attack has become virulent, they can be saved by constant spraying with Rosin Compound.

Hyphaene thebaica, the Doom or Doun palm, and Gingerbread palm of Egypt. Egyptian Bdellium is obtained from this palm. Like the *Borassus*, which it resembles closely in foliage, it is dioecious. It has a peculiarity rarely met with in palms, i.e., always growing with forked stems, sometimes if not generally, forking at the ground line, so that the plant appears with two stems, forking again some 6 feet up the stems and continuing to fork from each branch. Unfortunately no male plant has been raised in the Botanic Gardens, so that no fertile seeds have been obtained, though abortive fruits have been borne. An exceedingly fine plant of this species is to be seen in the Nursery near the Director's house, and a younger plant raised from seed received from Egypt is growing in the Calabash Walk. J. F. W.

MEETING OF THE BOARD OF AGRICULTURE.

A meeting of the Board of Agriculture was held at the Offices of the Board, Broad Street, on Friday, April 11th ; His Excellency the Governor presided.

PRELIMINARIES.

The minutes of the previous meeting having been read and confirmed the Chairman reported the deaths of Messrs. J. Gillespie and G. B. Withers, members of the Board ; it was unanimously decided to forward letters of sympathy to their relatives. The Chairman then reported among other matters the retirement of Mr. C. K. Bancroft, Assistant Director of Science and Agriculture, Government Botanist and Deputy Chairman of

the Board, the appointment of the Honorary Secretary, Board Agricultural and Commercial Society as an *ex officio* member of the Board; the appointment of Mr. Robert Ward, Superintendent of the Botanic Gardens and Agricultural Stations as a member of the Board; the importation of the Stallion Waterbass; the transfer of thirty acres of land formerly under rubber cultivation at Christianburg, Demerara River to the Department of Lands and Mines ; the death of Mr. D. Grant, District Agricultural Instructor, Canals Polder ; the amalgamation of the West Bank Farmers' Association with the Bagotville Agricultural Society under the name of the West Bank Agricultural Society.

THE VEGETABLE PRODUCTS FACTORY.

The Chairman then reported that the erection of this factory was proceeding apace and that the majority of the framework was already in position. The machinery itself had cost somewhat less than they had estimated.

SALE OF RUBBER AND CENSUS RETURNS.

Professor Harrison stated that during 1918 they got 52 cents per lb. for their biscuits of Para Rubber and 36 cents per lb. for scrap. The total amount thus made came up to $731.68. Freight charges totalled $160 or thereabouts which greatly detracted from what they would otherwise have made.

In connection with census returns of cultivation the Chairman remarked that he was not in a position to give all the figures as about six estates had not yet sent in their returns. This fact was apt to impede the working of the Board and also that of the Department. The failure of the Corentyne rice crop in 1918 was very pronounced ; the production of paddy being only from three to four bags per acre as opposed to the usual 18 bags.

RUBBER CULTIVATION.

Continuing, Professor Harrison, stated that rubber cultivation in the colony was slowly going from bad to worse and that this year there was certain to be a further abadonment of land under rubber. He attributed these facts partly to the leaf disease and partly to the present labour conditions—the difficulty of obtaining such and the high prices therefor. He saw no future prospects.

EDITORSHIP OF THE JOURNAL OF THE BOARD OF AGRICULTURE.

The Chairman stated that owing to the resignation of Mr. Bancroft, the Assistant Editor of the Journal, Mr. Bodkin, had been acting as Editor ; he now asked the Board to confirm Mr. Bodkin as Editor. The Board unanimously agreed to the suggestion.

ELECTION OF DISTRICT AGRICULTURAL INSTRUCTORS.

Professor Harrison said that there had been some considerable difficulty in the selection of suitable candidates and His Excellency had appointed three small sub-committees to assist in the selection. It was agreed to appoint Mr. D. D. Haynes, a recently retired schoolmaster who was now engaged in agriculture to the Mahaica District.

In respect of the West Coast of Berbice no suitable candidate had appeared and that it seemed out of the question to make any appointment whatsoever. The Rev. Eric. O. Robertson, in reply, remarked that this District was really in need of an instructor and suggested that a suitable individual be obtained from the Abary ; he considered that the selection might very well be left in the hands of Professor Harrison. Mr. Shankland then observed that the principal crop on the West Coast of Berbice was paddy and little, if anything, was done to instruct the people. He thought that every effort should be made to appoint a capable man as the District was, agriculturally, a good one. He deprecated the action of sitting with folded arms and doing nothing.

The Chairman vigorously repudiated Mr. Shankland's allegations of inactivity on the part of the Board and explained the difficulties they had experienced in attempting to discover a really good man for the post. Finally, the appointment was left at the discretion of the Chairman.

The Board agreed to the appointment of Mr. Antrobus as Instructor for the West Bank District.

DEMONSTRATION PLOT FOR BELFIELD.

In connection with the application from the Victoria-Belfield Agricultural Society to establish a half acre demonstration plot Professor Harrison stated that the expenses might come out of the contingency vote. The principal cost was for a watchman.

After some discussion His Excellency decided that if the Society paid the watchman he would let them have the $37 ; the balance of the money required. On the suggestion of the Chairman it was definitely decided to import a short-horn bull and two short-horn heifers in calf from the U.S. during 1919.

NEW SCHEME FOR AGRICULTURAL APPRENTICES.

The Chairman then outlined the new scheme for Agricultural apprentices whereby, he stated, they hoped to obtain about 40 apprentices who would be trained for four or four and a half years. Tuition would include the keeping of agricultural books. After discussion it was decided to send the stallion donkey to Port Mourant, Corentyne Coast, under the care of Mr. J. C. Gibson the Manager and then to the West Coast of Berbice where it would be under the care of Dr. Gewand. The Rev. Eric O. Robertson then made a graceful valedictory address to His Excellency who expected to proceed shortly on leave; Mr. H. E. Murray suggested, and it was agreed to forward a letter of sympathy to the relatives of Mr. C. K. Bancroft, although he was not a member of the Board at the time of his death.

The Board then adjourned *sine die*.

OBSERVATIONS ON THE EAST COAST AGRICULTURAL DISTRICT DURING THE YEARS 1915-1918

By E. M. Morgan, Chief Agricultural Instructor, E.C., Demerara.

More significance is being attached to discussions in the various Agricultural Societies on the East Coast than to the actual performance of practical work at the farms.

To my knowledge, a series of lectures would be beneficial both to the peasants and agriculturists, especially if the various methods of cultivation given were carried out in conjunction with different phases of plant life; practical demonstrations on individual plots should accompany such lectures.

Time and interest in maintenance of good cultivations are not sufficiently devoted by our small farmers. It is to be deplored that the time spent in the township by our young men and women is not utilised at the farms aback or in the environments of the home cultivating kitchen gardens, crops, or the fostering of flowers. Our village politicians would be of immense assistance in encouraging this kind of work rather than arguing about the present Colonisation Scheme; thus the threatened dearth of ground provisions would be removed.

The yearly hue and cry for new lands is still prevalent, but with the exception of Golden Grove and Nabaclis (where the major area is under coconuts) but little real claim exists therefor. The time is inopportune for such as we cannot be satisfied that the present polders have been systematically and efficiently cropped and left under permanent crops such as coconuts coffee, fruits, etc. Also, we can be satisfied that we have efficiently drained and irrigated these polders. At present two or three days heavy rain occasion and inundation with accompanying destruction of provisions. Further, we cannot be satisfied with the principle of using the main drainage trench as a drainage, irrigation, and navigation canal. It is incumbent that improvements be carefully carried out on the existing cultivations before additional lands are empoldered.

The difficulty of solving such problems rests with the Village Councils who are composed of a greater number of pedagogues and tradesmen than of practical farmers. Such individuals, although considering themselves omniscent, decline to allow irrigation from the proper source, i.e., the middle walk or sweet water canal. The reason given is that the tapping and laying down of a small box koker or pipe would contaminate the sweet water. Though this objection to tapping the canal aback is strictly adhered to, little or no precaution is exercised to preclude pigs, ducks and other animals from contaminating this same canal in its course through the township lots. The Councillors must be asked to co-operate with the farmers in this particular respect.

It has been pointed out on several occasions that unless the drainage trench is kept very low the heavy rains will occasion inundation; the Company Canal, if it is thoroughly cleaned, will assist drainage, and be most convenient for navigation.

It is now generally realised by the farmers that it pays to extensively plant permanent crops. Such crops are of immense benefit to the farmer, and will serve readily as a substantial pension in old age and decrepitude. Therefore provision should first be made for efficient drainage and irrigation of such crops so that the empoldering of new lands will be a step to progress.

Immediately on the outbreak of the great European war the Director of Science and Agriculture detailed two of his officers to visit and instruct the farmers on the East Coast as to the advisability of extensively cultivating early maturing crops such as corn, peas, and provisions in general, with the view to alleviating as much as possible the great shortage of imported foodstuffs. The Presidents of the various agricultural associations were also invited to co-operate with the Department and to induce the farmers to carry out the instructions.

These timely instructions received prompt attention and it was gratifying to note the interest evinced in the preparation and planting of new lands.

Early in 1915 the writer was appointed to assume residential duties on the East Coast and to be at the disposal of the farmers. A considerable portion of the work has been devoted to the cultivation of provisions; attention being given to seed and plant selection; attention has also been given to coconuts, fruit, coffee, rice and sugar cane. It is satisfactory to mention that such work has resulted in the production of more satisfactory returns. The direct work of pruning fruit trees for the farmers has been appreciated, which is indicated by the alacrity of the majority to adopt such advice.

An experiment, which promised to be of great import, is to be started by the Victoria-Belfield Agricultural Association to demonstrate to farmers a method of cultivating early maturing crops on small plots. It is proposed to place the scheme under the care of the Agricultural Instructor so that it may be carried out systematically for a number of years; beyond doubt it will afford information of considerable value to the farmers.

A considerable amount of activity has been displayed by the planters in distributing lands already drained to farmers for the cultivation of provisions, notably among these are Plantations Lusignan, Non Pareil, Enmore, Hope La Bon Mere, and Cane Grove. Full advantage has been taken throughout of this opportunity.

As a further impetus to the farmers on the East Coast the Department of Science and Agriculture has distributed over 500 pounds of peas and 2,000 pounds of selected rice paddi: these proved to be of immense value and were greatly appreciated. It only remains to the farmers to cultivate their lands assiduously. The spasmodic and perfunctory manner in which some East Coast farmers pursue their duties is to be regretted.

THE COMPOSITION OF MILK BEFORE AND AFTER SCALDING

BY K. D. Reid, 1st Assistant Analyst, Government Laboratory, British Guiana

In the Journal of the Board of Agriculture for the last quarter I dealt with the percentage of fat and the specific Gravity of milk which was found to be genuine before and after scalding.

Further information to hand points to the fact that milk vendors in this colony are in the habit of scalding milk during the afternoon and leaving it overnight. Next day this milk is mixed with the morning's supply after being strained through a piece of muslin which may, or may not be, clean and, by this means, the fat which has risen during the night is collected together with the portion of cream which came to the surface on scalding.

The proportion in which the samples are mixed cannot be determined with any degree of accuracy as the supply regulates this, but I am assured it is very often 1 or 2 parts of the afternoon's supply with three of the morning's milking.

There is, therefore, a considerable time during which the afternoon's milk has been left standing before it is mixed and exposed for sale. On enquiry I find it may be taken as approximately twenty hours' duration.

Dairy chemists will readily notice that the fat is liable to considerable variation on this account. The question, however, is very complex as there are no figures on which one can place any reliance.

Published lists point to the fact that, whereas it may be considered advisable to accept 0.1 per cent. for every 15 minutes standing the probable reduction cannot be calculated on account of the considerable difference in the quantity of fat given by different breeds of cattle. There is also the factor of food supplied which influences the percentage.

In this Colony, where the breed is a mixed one and the quality of food given is not uniform, these factors have reluctantly to be discarded and other means adopted to ascertain the variation in the fat content

As described in the last issue of the Journal samples of milk which on analysis were found to be genuine were scalded and every precaution taken to prevent over-evaporation. These were left standing for a period not exceeding 24 hours, strained, divided into three equal parts and marked "A, B, and C."

Another sample marked "D" was fresh milk purchased and on analysis found to be genuine.

"A," the composition of which is the same as "B" and "C" was analysed and the result noted.

"B" was then mixed with "D" in the proportion of 1 in 3 and its composition also noted after analysis and "C" was also mixed with "D" but in the proportion of 2 in 3 and subsequently analysed.

"X" represents the composition of the original sample before it was scalded.

The following are the results of these analyses:—

	X	A	B	C	D
Specific Gravity	1030	1036	1032	1033	1031
Fat	5.8	5.5	4.8	4.9	4.0
Solids not fat	9.7	11.1	10.0	10.4	9.6

The figures are consistent with others relating to samples similarly treated.

It was considered advisable to make an analysis of the cream collected. This was done and the following are the results:—

	A	B	C	D
Water	43.0	53.0	55.0	57.0
Fat	41.0	34.0	32.0	30.0

It will be noticed that the results are in conformity with those obtained in the previous paper. The experiments were carried out with the object of obtaining information as regards the composition of scalded milk left standing for over 8 and not exceeding 20 hours.

It has therefore been established that genuine milk scalded once and left standing for a period not exceeding 8 hours, when freed of that portion of the cream which is to be found on the surface, remains genuine, and that on standing for over 8 hours and not exceeding 20 it does not alter in its composition as regards both its fat content and specific gravity to such an extent as enable an analyst to return the sample as below the legal standard.

It was further thought to be of interest to ascertain the composition of a sample of milk left standing for 20 hours and which was scalded a second time, the cream being removed as hitherto.

The results are in accordance with those obtained when the milk was left standing for a period of 20 hours and which was scalded on one occasion.

Vendors of milk should always remember that the composition of the food supplied to cows bears a definite relation to the quality of the milk obtained and, should indifferent food be given, they must not expect to obtain milk high in its fat content.

The habit of partially milking cows should be abandoned, and if proved by the Magistrate, made punishable. It is pleasing to record the assistance given by Mr. F. J. July, Acting Chief Government Sanitary Inspector, to milk vendors in this respect. Ignorance, therefore, cannot be pleaded. Milk is ever so much richer in fat when the cow has been milked dry and the contents properly mixed. The habit of partially milking cows renders the milk poor in fat, and the milk thus lowered in quality when offered to the public is decidedly a fraud.

It is the writer's opinion that the legal aspect should be in agreement with the opinion of Public Analysts throughout the world as regards the meaning of the word adulteration or adulterated.

It is considered that any foodstuffs offered for sale, the composition of which is found to be below the legal standard, should be considered impure or adulterated, and that this adulteration may be the result of actual tampering with the sample—

or as in the case of milk, through wilful neglect, indifferent food having been given cows, the milk contains fat below the legal standard of 3.25 per cent. or else the solids-not-fat is lower than that fixed by law.

Too often it is recorded that an astute member of the legal profession has, by raising some legal point, compelled a Magistrate to agree with him as regards the interpretation of an Ordinance, and the vendor whose milk is below the legal standard has been acquitted.

Increased interest has been taken lately in a cattle trade with Brazil and our neighbouring Colonies. To command high prices it is essential that healthy stock be offered for sale, and it would not be too much to say that breeding on proper scientific lines is of primary importance.

It appears, therefore, desirable that an attempt be made by dairymen to take full advantage of the special efforts of the Board of Agriculture to improve the breed of cattle in the colony The efforts are based on Mendelian principles which aim at the establishment of a breed which will have marked characteristics as regards quality and quantity of milk as well as power to reproduce without any marked backward tendency which climatic conditions may impose.

Unless buyers at the annual sale of live stock consult the Committee who control this portion of the Board's activities i.e., the inter-breeding question, and are prepared to isolate their improved stock on their cattle farms, the efforts of the Board in this direction are hampered to a considerable extent, as interbreeding of improved stock with the poor bred cattle which are to be found on many farms in the colony tends only to produce inferior stock after a few years.

This is one way to control our milk supply and ensure as far as possible a high standard in regard to the fat content.

The Director of Science and Agriculture has on more than one occasion drawn the attention of the public to the danger of an unsatisfactory milk supply, and as the success of the Baby Saving League and other like associations depend to a large extent on a pure milk supply, it seems that in the near future the establishment of a dairy run on proper lines will have to be considered by the Municipal Authorities with or without financial

assistance from the Government. There is nothing new in this as such an establishment was recommended by the Mortality Commission of 1906.

PLANT DISEASES AND PESTS NOTES.

The Sugar Cane Froghopper. We have recently received an interesting little brochure entitled "A Froghopper on Sugar Cane in British Guiana" by C. B. Williams, M.A., F.E.S. of the Department of Agriculture, Trinidad, B.W.I

The contents constitute a full account of the sugar cane froghopper (*Tomaspis flavilatera.* Urich) of British Guiana, its natural enemies, and some suggested methods for its control.

Mr. Williams, who enjoyed the hearty co-operation and assistance of the British Guiana Department of Agriculture, and of Mr. Harold Moore, an entomologist employed by the leading sugar concerns of the Colony—facts he does not record —has succeeded in producing a most comprehensive paper on this minor pest of the sugar cane.

During his visit in 1916, Mr. Williams whilst on a visit to one of the Essequebo sugar estates in company with the Government Economic Biologist, on making a diligent search, was successful in discovering a few adults of this species of froghopper. Their presence on the sugar canes in this particular locality had not, according to him, been previously observed. Mr. Williams duly records this fact in his paper. Unfortunately, Mr. Harold Moore happened to observe this same insect on the same estates during 1911-1912.

An interesting account of the egg, its appearance and where deposited is given. This closely coincides with the appearance of some eggs of this insect which we had the opportunity of inspecting some time prior to Mr. Williams' visit through the courtesy of Mr. Harold Moore their discoverer.

A painstaking account of the nymphal stage appears and characteristics are set forth whereby the nymphs of this species may be distinguished from those of *Tomaspis pubescens.*

The natural enemies of the immature stages as recorded by Mr. Williams include the Vermillion Egg Parasite *(Oligosita*

giraulti), a species of thrips which was observed to feed on the eggs, the Syrphid fly (*Salpingogaster nigra*), whose larvae feeds on the nymph. The larvae of this fly were observed by the Government Economic Biologist in 1913. The parasites of the adult constitute a formidable list and include the Muscardine fungus, dragonflies, spiders, ants, predaceous bugs, grasshoppers, lizards, and eight species of birds (*seen* in the canefields or proved, by dissections, to consume froghoppers *in Trinidad*) and the mongoose, whose presence Mr. Williams deprecates and is apprehensive lest it should penetrate to the Rupununi Savannahs!

The paper concludes with a detailed description of an ingenious sweep-net method of catching the adults which Mr. Williams instituted at Pln. Ogle, East Coast Demerara, and which, according to his account, proved extraordinarily successful.

We cannot contribute to his statements that "there is no long dry season in British Guiana," and that "the mongoose is still comparatively scarce."

A list of references is appended; it omits those on the subject which from time to time, have appeared in the publications of the Department of Science and Agriculture, British Guiana.

Anopheles mosquitoes. On page 42 of Issue No. 438, Vol. XVIII. of the Agricultural News, Barbados, there appears the following: "The Anopheles mosquito flies from just before sunset to about sunrise, and during this time every precaution should be taken to prevent the entrance of mosquitoes into the house, and to prevent mosquitoes from biting."

This statement has been extracted from "Insect Notes" under the caption "Suggestions for mosquito control in a West Indian Island."

We are not aware to what exact species of Anopheles mosquito the writer of this article refers, or whether he refers to the Anopheles mosquitoes as a whole. The statement as applied to the Anopheles mosquitoes of British Guiana is incorrect. Speaking from personal experience here we have time and time again observed the Anopheles to bite in broad daylight, at times even in sunlight and this in several parts of the colony.

Protecting sown seeds from Ants. In the 1917-1918 Report of the Agricultural Department of Tortola it is stated that by shaking onion seeds up in red lead powder before sowing the depredations of ants were prevented. This is a very effective method of preventing the removal of the seeds by ants. Although it may be an old method we have not previously heard of it and consider that it could be successfully applied in British Guiana to any kind of seed before sowing.—G.E.B.

PLAIN SPEAKING ON PLANT DISEASES.

Extracts from a letter written by C. O. Farquharson, late Mycologist, Southern Nigeria, to the Assistant Director of Kew England.

'As you know, we have been having a great time with coconut bud rot. In regard to that disease, it seems to me that too much has been made of *Bacillus coli,* and the elementary fact has been lost sight of that dicotyledonous plants die back following asphyxiation of their roots, for want of drainage, or other adverse soil factors. The first symptom is the death of the growing point of the main axis, if there is one, or of that and the side branches. Now a palm has only got *one* to go on with, outside its fronds, and when that goes there is no hope of recovery. That growing point can "go" exactly as one or many of the growing points of a dicotyledonous tree may, and for the same reasons. The essential remedy is proper cultivation, growing the palms in the proper place, on a proper soil, in the proper way, with plenty of light and air. People have been so obsessed with the maritime habitat legend that they fail to see that the palm does well there because there are few competitors, and it can get abundance of light to seaward, and plenty of breeze.'

'I hold strong views on cacoa disease out here. The pest of cacao is the native. He doesn't "cultivate" cacao. He exploits a "weed" that yields a product closely allied to cacao. I told the Government here that cacao grew like a weed, that in fact it *had* to grow like a weed in order to survive. I illustrated this by reminding them how difficult it is to keep a prize vege-

table (raised by long and intelligent selection) up to the prize standard. If it is put on poor land, and is untended and generally neglected, it will have to revert to "weed-dom" if it is to survive at all, and if it does, it will be no sweet and tender vegetable, but a hard-bitten, fibrous, just edible weed.

I know there are other causes of die-back in cacao and other trees than lack of drainage. I have had such problems, but I am convinced that all of them can and must be solved without the aid of one-twelfth-inch objectives and Bordeaux mixture.

'Unquestionably some of our insect pests are only pests when the agriculturist has failed. The agriculturist may not like to be told that. He doesn't object to be told to spray. There is a fine "act of God" feeling about it; so fine indeed that he doesn't even spray, but is satisfied with the belief that it might be done with success.'

'If I had to map a course for a plant pathologist, I would make a year's residence on a farm compulsory, and make physiology, systematic, and applied (the latter being essentially intensive agriculture and including soil-physics and meteorology) the chief subject. I would bar microscopes till the last year of the training. Every spare hour should be in the field. Field physiology, as opposed to laboratory physiology studied by means of beakers, tubes, and all sorts of ingenious appliances, is a study that wants developing.'

'My experience here, especially being in a position in which I was more or less responsible for getting up crops, or giving a plausible reason for failure, has convinced me that every mycologist ought to be deprived of his microscope (and perhaps even of his pocket lens) for at least the first tour of his service, and perhaps for two years, and compelled to raise *normal* crops with no artificial aids of any sort. If possible also, he should be compelled to study a really representative half-dozen drainage problems, and see them solved by experts. He would greatly benefit by having to dig a few drains himself. I do not pretend to be an expert, but for the first two months of this tour I did dig drains, bits of them, myself, and supervised the digging of an open system, three feet (and even over) deep. I had to do this because I diagnosed asphyxiation to account for defoliation and die-back on some of our cacao here.'

REPORT OF THE BUXTON AND FRIENDSHIP FARMING ASSOCIATION

During the Quarter ended 31st December, 1918, the Buxton and Friendship Farming Association passed a few important motions which, if given effect to, will have far-reaching results as far as the Farmers of the District are concerned. Arising from a communication from the Director of Science and Agriculture offering the Association the loan of a Pedigree Boar for the use of the District in improving the breed of pigs, the Association decided to purchase a trio of young Berkshire pigs from the Government Industrial School at Essequebo, and apply for the loan of a Boar, on the terms as stated in the Director's letter. This resolution to be given effect to as soon as the stye and enclosure were erected.

It was also decided, following the discussion of a letter received from Mr. Charles Shankland, to apply to the Village Council for a plot of land for the cultivation of Castor Plants. The land was obtained, and the work of preparing same was actually started but has been discontinued through unforeseen circumstances. It will be put through as soon as possible.

The next resolution was one moved by Mr. C. T. Holder, that the Association apply for, and keep for the convenience of farmers, Ceylon or other Coconut plants, also economic fruit plants, the Agricultural Instructor to advise frequently as to their care, etc., etc. The matter having been referred to the Department, a reply was received to the effect that only nuts could be procured. Further representation is to be made at a later date.

On Tuesday evening 18th February, the Monthly Meeting of the Association was held in the Village Office. Mr. Emanuel Joseph, President, presiding. There were also present Messrs. A. D. Philadelphia, Vice-President J. C. Verbeke, Secretary, J. D. Young. Treasurer, C. T. Holder, G. McL. Ogle, J. E. Wills, J. David, Oscar McGarell, J. B. Cockfield, and seven other members. The Secre-

tary's Report for 1918, which was read and adopted, along with the financial statement, showed a membership of 91 at the close of the year.

Mr. Ogle asked what progress had been made in the construction of the stye for the starting of the Piggery. The Chairman said that the work was going on satisfactorily, and a report would be made during the course of the week.

The Meeting then proceeded with the election of Office Bearers for the ensuing year, with the following result:—

President, Mr. G. McL. Ogle, Vice-President, Mr. A. D. Philadelphia, re-elected. Treasurer, Mr. J. D. Young, re-elected. Secretary, Mr. J. C. Verbeke, re-elected. Asst. Secretary, Mr. Oscar McGarrell, Committee, Messrs. E. Joseph, C. T. Holder, J. David, and J. E. Wills.

SMALL BEGINNINGS

BY REV. ERIC. R. O. ROBERTSON

This is a true and simple record of the work accomplished by the farmers of the Abary Agricultural Association during the past two years. I give it to the public in the hope th[illegible] may encourage the small farmers of our Colony and help them to see what can be done by co-operation, proper organisation and industry on their part. One of the speakers at the recent Conference of the District Agricultural Associations attributed the success of the Abary Association to the splendid leadership of its Founder. This is not the whole truth. Much of the success which attended the efforts of the men was due to the sympathy and practical help given by such men as the Hon. A. P. G. Austin. Mr. Chas. Shankland and Professor Harrison; whenever farmers showed themselves deserving of help that help was freely and willingly given, and thus experience proved that the gods help those who help themselves.

It was early in 1917 that I realised the urgent necessity of doing something to awaken the people of the Abary district to a sense of their social and industrial condition. The village

was like many another in the colony. The population was a small one consisting of about 300 souls, the majority being Negroes. The people lived in mud-houses thatched with cocoanut branches, their chief occupation was growing just enough rice and provisions to last them till another crop time.

Communal life there was none. Dissension, strife and jealousy had destroyed the best in the social life. There was no co-operation, no unity, no ambition. Thrift was practised only by a few. The conditions existing were a menace to the Church and a direct challenge to its ministers. The Church life was no better than the home life.

It was impossible to get everybody to see the necessity of immediate effort. However, four or five did see and these men became the nucleus of the Abary Agricultural Association Every effort was made to arouse them to a deeper sense of responsibility, to teach them that their success depended on their own initiative and industry, upon their co-operating and uniting to improve conditions. To enable them to do this, I decided to get every member to aim to reach a certain mark within 12 months. A definite and bold programme of work was put before them after very careful enquiries had been made about each member. This inquiry embraced such matters as his financial standing, what debts he owed, his present means, the amount of land cultivated, the worth of his crops, the size of his family, the nature of his crops. Indeed, everything was thought of. The keen interest which was thus displayed awakened the sympathy and curiosity of others and as a result the Association increased considerably in numbers.

The information acquired helped us greatly in getting the maximum effort from every member. On account of the scarcity of foodstuffs in 1917 the Association decided to insist on every man increasing the acreage under cultivation and right nobly did the farmers respond.

Having thoroughly organised the Association the next difficulty was to provide assistance for the farmers. A Loan Bank was formed in 1917 and the sum of $200 was lent out to farmers. This was however totally inadequate to the needs of the farmers and here the management of the Colonial Bank

showed its deep sympathy with the farmers and desire to develop the minor industries and incidentally create a peasant proprietary. Mr. C. V. Sayles and C. E. Winter who possessed an unrivalled knowledge of agricultural conditions initiated, with the consent of Mr. A. P. G. Austin, a new policy in assisting the small man and whatever improvement there has been in their financial condition all is due to them. At the end of 1918 over three thousand dollars loaned to the Abary farmers had been repaid. It is a creditable record of which the Association does well to be proud.

It is interesting to relate, as showing how well the members understand the meaning of co-operation, that in the case of two farmers who died after their lands had had their first ploughing that the Association men turned out, completed the work, planted and reaped the crops paid the loans due and handed the surplus to the wives of the deceased. The crop at the end of 1918 realised over $30,000. It will be asked what are the farmers doing with their money. We could very well answer "Come and see." Six new shingle cottages have been built at a cost of over $3,000. The thatched houses are used for other purposes now. Eight have repaired their homes, five have completed the purchase of their lands, nearly $3,000 have been spent in buying oxen, not to mention other improvements.

At the end of 1919, if the conditions are favourable, the crop estimated to be reaped will be the largest in the history of the Abary district.

The possibilities of the District from an agricultural point of view are tremendous. The lands are easily adapted to cattle-rearing and to the cultivation of rice and cocoanuts.

Every effort will be made to secure in 1920 an Irrigation pump and a Community Tractor.

We have had our difficulties but we have hit them on the head. Our war is against poverty and uncleanliness and disease and slowly but surely we are winning. Farmers here have learnt to do things for themselves by co-operation and industry.

I should like in another issue to tell how the farmer who began with sixpence two years ago at Mahaica is now worth $500

THE JOURNAL OF THE KEW GUILD, 1919.

Through the courtesy of Mr. Robert Ward we are able to reproduce the following extract from this excellent publication—

Gunner R. Service was killed at Bourlon Wood on September 28, 1918. He had only just returned from fourteen days' leave. He called at Kew on his way home to Dumfries and again when returning to France. Serving with the trench mortars in the 4th Canadian Division, Mr. Service was with the Canadians during the heaviest of the fighting. He might be described as a born soldier, knowing no fear—it was great sport in his opinion. We met him in the Temperate House on his last Sunday afternoon in England, and in relating his thrilling experiences and narrow escapes one might have been listening to the description of an International Rugby football match instead of the grim realities of war.

Mr. Service was born in Maxwelltown, Dumfries, 27 years ago. He came to Kew from Messrs. J. & R. Service of Dumfries in October, 1912, leaving in May, 1914, to take up the position of Horticultural Superintendent in the Department of Science and Agriculture, British Guiana.

He joined the Canadian Army at St. John's, Newfoundland, in January, 1917.

SPRAYING COCONUTS*

In order to be effective, the spraying should be thorough and the application liberal, and the pressure should be sufficient to cause the spray to settle on the plants as a fine mist and not in large drops. This is important in spraying any plant but it is peculiarly so in spraying palms because of their habit of growth. *Heavy spraying so that the spray collects and runs down into the bud should be guarded against or the trees may be seriously injured or even killed by the mixture.*

* From the Philippine Agricultural Review. Vol. XII. 1918.

It is important that the spray mixture be well strained in order to prevent the nozzles from becoming clogged in the act of spraying. It is also well to remember that copper sulphate and the arsenates are very poisonous and should not be left where they are accessible to children or domestic animals.

The arsenical sprays are employed in the destruction of biting insects that eat the poisoned leaves. The oily sprays or those containing sulphur are commonly referred to as contact sprays because they kill the insects by contact. Therefore it is very important that the latter class of sprays be sprayed *on the insect whose destruction is contemplated as the spraying of the plants themselves is ineffectual.*

Thoroughly rinse out the spraying implements with clean water when the spraying is completed.

A barrel sprayer mounted upon a cart will be found the most serviceable spraying implement on a moderate-sized plantation.

FORMULAS FOR FUNGICIDES, INSECTICIDES AND WEEDICIDES.

FOR FUNGI

No. 1.—*Bordeaux mixture.*

Copper Sulphate	kilograms	1.5
Unslaked lime	do.	1
Water	liters	100

Place the copper sulphate in a coarse sack and suspend it in a barrel containing 50 liters of water so that the sack is entirely covered by water. Slake the lime in another vessel and when slaked dilute to 50 liters. Before mixing, stir the two solutions vigorously. Then dip a bucket from each solution and pour the two liquids together in a spray barrel, at the same time agitating the mixture vigorously. An excess of copper sulphate is injurious to the foliage, and, before spraying, the mixture should therefore be tested. This is done by inserting and holding in the mixture a clean steel blade for one or two minutes. If copper is deposited on the blade, more lime must be added. Use the mixture at once.

FOR SCALE AND SUCKING INSECTS

No. 2.—*Kerosene emulsion.*

Kerosine	liters	7.5
Hard Soap	kilogram	.25
Water	liters	4

Dissolve the soap in boiling water and, while still hot, add the kerosene. Churn the liquid steadily for fifteen or twenty minutes by using a force pump, the liquid being pumped back into the vessel until it is emulsified. Sufficient hot water should be added to increase the volume of the solution to 16 liters. For spraying, dilute at the rate of 1 liter of the stock solution to 15 to 20 liters of cold water.

No. 3.—*Resin wash.*

Caustic soda (98 per cent.)	do.	2.25
Resin	Kilograms	.9
Fish oil	liters	1.5
Water	liter	75

Pour 75 liters of water over the resin (which should be well broken up), caustic soda, and fish oil in a large iron kettle and boil for three hours. Then add hot water from another boiler (which should be provided for this purpose) from time to time, and stir thoroughly until there are 190 liters of the solution. If desired for immediate use, dilute each liter of the solution with 2 liters of cold water before using. If kept as a stock solution, it should be diluted at the same ratio when used.

FOR FUNGI AND SCALE

No. 4.—*Self-boiled lime-sulphur wash*

Quicklime	Kilograms	3
Sulphur (flour or flowers)	do.	3
Water	liters	100

Place the lime in a barrel and pour on enough water to cover it. When the lime begins to slake add the sulphur after running it through a sieve to break the lumps. Stir the mixture constantly and add water as needed to form a thick paste

at first and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. As soon as the lime is well slaked add water to cool the mixture and prevent further cooking. Strain carefully, working the sulphur through the strainer and dilute to 100 liters.

FOR BITING INSECTS

No. 5.—*Arsenate of lead.*

Arsenate of lead	kilograms	0.5—1
Quicklime	do.	0.5—1
Water	liters	100

Slake the lime in a wooden vessel, dilute to 100 liters, and dissolve the arsenate of lead in the liquid.

FOR WEEDS

No. 6.—*Arsenite of soda.*

Arsenite of soda	kilograms	1
Water	liters	40—70

Dissolve and spray of—

White arsenic	kilograms	1
Washing or sal soda	do.	2
Water	liters	8

Pour the water over the arsenic and soda in a kettle and boil for 15 to 20 minutes, or until the mixture is clear. The clearing of the solution indicates that the proper chemical combination has been effected. Dilute at the rate of 1 part of the stock solution to 14 to 24 parts of water and spray.

HINTS FOR PRACTICAL POULTRY MANAGEMENT.

Success in egg production is as much due to good management as to prolific stock.

Cleanliness is one of the most important factors and should be practised in regard to the house, the bird, and the food and water. A little thought and ingenuity will evolve methods securing the desired end with the minimum of labour.

Parasites.—There should be no red mite or hen fleas in properly-kept houses, and lice on the fowls can be kept down by rubbing sulphur into the feathers, and providing facilities for a dust bath.

Light and Ventilation.—The value of ample light in the shed cannot be overestimated, and if the house is well ventilated the birds will keep bright and healthy.

Exercise.—Exercise induced by keeping the birds well occupied is of great importance. Several inches of dry litter should be kept on the floor of the scratching shed. It should be of a light nature, such as straw chaff, dry leaves or bracken, in which the corn given is scattered for the birds to seek; the burying of grain in soil or the use of material of a heavy nature for the birds to turn over is a mistake often made. Such heavy work is not conducive to a large egg yield, although for breeding stock it is good to keep the fowls in hardy, muscular condition.

Feeding.—Plenty of fresh green food, shell and grit, have great effect in increasing egg production. Green food, unless chopped into small pieces, is best suspended to enable the birds to peck pieces off more readily; stale stumps and leaves should not be allowed to lie about. Old scraps of flesh or fish, e.g., rabbit offal or fish skins, are valuable food, and should be saved and given after cooking; there is little fear of over-feeding an active type of fowl if the food given is of a correct nature to meet the bird's requirements.—

Board of Agricl. Journal, England, Sept., 1918.

COCONUT CULTIVATION

Many people consider that the cultivation of the coconut consists merely in digging a hole and planting a seedling coconut in it. Possibly this cultivation may extend to putting a fence of some sort round the seedling to protect it from goats and cattle. It may even extend to watering the tree in the hot weather. But when the tree is once established it is left very much to itself until it begins to bear nuts. Some trees are fortunate in being near a dwelling and benfit by the water and refuse from the house. Such trees can always be recognised; in fact it is usually possible to locate the houses in a coconut tract by the luxuriant growth of the few trees which surround the house..

This however is not farming. It is not the growing of coconuts for the profit which one ought to expect from them.. It is possible that such coconut cultivation does pay an interest on the money invested, but it is nothing like so great as the interest which one should expect.

There are four main essentials, which the coconut tree requires, viz., light, air, water and plant-food and I will deal with each of these in turn.

Light.—A coconut tree must have its leaves in the full sunlight, because the leaves have definite work to do. They manufacture the plant-food, which builds up the tree and develops the nuts. They also give off large quantities of water and the brighter the sunlight, the more rapidly do they give off water. This water which is given off, has to be replaced and the roots therefore have to work harder to absorb more water from the soil to replace the water lost by the leaves. This water from the soil contains the mineral matter which the plant requires and which forms ash when the dry parts of the plant are burnt. It is evident then that, if the leaves have not full sunlight, they cannot do a full day's work and this makes the roots lazy too because the line of communications is, so to speak blocked between them and the leaves. This is why coconut trees which are too crowded or are over-shadowed by other

trees such as the jack, mango, etc., do not bear fruit properly. The first axiom therefore is:—Do not over-crowd your garden. Sixty to seventy trees per acre are quite sufficient —and do not crowd them with other trees which are likely to interfere with the light requirements of the coconut.

Air.—Besides the requirements of the leaves, air is also required for the roots. These must have air, which means that the soil in which the roots feed, must be well drained. If you dig down to the water level in a backwater area planted with coconuts, you will find that no roots will enter the stagnant water below. This is because, there is no air present in the stagnant water. If the water in the soil is moving, it does not harm the tree because the movement of the water sucks in the air. It is for this reason that the coconut will flourish right on the edge of the sea coast. It is essential therefore that, if a coconut garden is to pay, the drainage of the garden must be sufficient and that there is no stagnant water within three feet of the surface. If such natural drainage is impossible, it can often be made by making wide ridges and planting the trees on these, the furrows between the ridges being so connected that they can carry off any stagnant water. The writer has seen backwater gardens with the soil, two feet below the ground, sodden with water and yet which have to be regularly and frequently watered for 7 to 8 months of the year. Coconut cultivation under such conditions does not pay.

Water.—Just as a man requires so much water to drink, yet if you hold him under the water, he will drown, so it is with the coconut tree. This requires large quantities of water which it has to get from the soil. Yet, as has already been stated, if the soil is full of stagnant water, the roots will drown. Therefore, besides seeing to the drainage, it is essential to see that the soil retains enough water for the needs of the plant. It has been estimated after careful experiment that a coconut gives off from the leaves between 200 and 250 gallons of water a year, i.e., over 30 cubic feet. Most of this water is given off from the leaves when they are in full sunshine which means that the trees have little work to do during the rains. When

the monsoon is over and bright weather is expected then the trees have to work hard. Thus most of this water is required in the soil from November to May, i.e., the six months when very little rain is expected. It is obvious therefore that the farmers' object is to keep as much moisture in the soil as possible after the rains have ceased and to keep it for his coconut trees. This can be done by ploughing the soil beneath the trees. The main object is to make and keep the surface soil loose, because a loose dry surface soil prevents the soil beneath from getting dry. A secondary object is to destroy grass and weeds. These also take up water through their roots and if the weed growth is heavy, the soil soon becomes hard and dry.

Plant-food.—Although plants manufacture the greater part of their bulk in their leaves by the combination of the water taken in by the roots with gases absorbed from the air—all such substances as wood, fibre, sugar, oil, etc., are thus manufactured, yet without certain substances, the plant cannot live. Most of these are found in the ash of plants when these are burnt, they are taken in by the roots of the plant dissolved in the water from the soil. It is these substances as well as nitrogen which are called plant-food, and which must be present in sufficient quantity in the soil if the crop is to thrive.

The case of the coconut however is different from that of ordinary annual crops, because the coconut is perennial and its roots penetrate far and wide through the soil in search of food and moisture. These can usually find enough of these substances to ensure a paying crop of nuts. I would here emphasize again the importance of drainage, because without this the area the roots have to search for food is limited. Also the question of cultivation to preserve moisture, because the roots cannot take in plant food unless it is dissolved in water. In time, however, a succession of heavy crops may exhaust the soil of plant-food. If it were only the coconut meat or copra which was disposed of, it would not matter, but it is usual to sell all parts which fall or are cut from the tree either as fuel, plaited leaves, etc. It is especially wasteful to sell the coconut husks as these are very rich in potash and potash is the most expen-

sive and, at the same time one of the most essential plant-foods of the coconut. The leaves are not so important as their ash consists largely of lime and this can, if required, be purchased at a small cost. As far as possible the ash of the husk should all be returned to the soil. If fish manure at the rate of 5 to 10 lb. per tree is also supplied, this will supply the other two main essentials of plant-food of which the soil may become exhausted, namely, phosphates and nitrogen. These manures should be applied evenly throughout the garden at the commencement of the monsoon and ploughed in. They will then wash down into the soil where they come within reach of the roots. Do not manure the trees after the moonsoon, because this manure will remain near the surface and may cause the roots to grow towards the surface. This you want to avoid because the roots have to take in moisture and the surface will become too dry before the next rains. Do not also spread the manure just round the stem of the tree. Your object in manuring is to develop a spreading root system so that the roots can obtain moisture through the dry weather. If you concentrate the manure round the stem the roots will tend to congregate there and they will have to compete against each other to obtain moisture.

Madras Agricultural Calendar.

AGRICULTURAL STATISTICS, 1918.

The following is a statement of the various agricultural crops and stock, their areas and numbers, for the coastland of British Guiana during the year 1918. Similar figures for 1917 are added for convenience of comparison.

	British Acres.	
	1917	1918
Sugar Cane	77,823—(for 1918)	73,565—(for 1919)
Rice	64,814 (reaped)	59,815 (reaped)
Coconuts	23,870	29,444
Caco	1,970	1,997
Coffee	4,950	5,150
Rubber	5,230	3,981
Limes	1,480	1,350
Provision Crops	18,247	21,959

	Principal Products	
	1917	1918
Sugar	108,181 tons	107,560 Tons
Rum	4,165,625 Gals	3,618,250 Gals.
Padi	1,121,070 bags	590,740 Bags (140 lbs)
Coconuts	No Record	14,217,400 Nuts
Coconut Oil	No Record	18,560 Gals
Copra	" "	5,250 Cwt
Lime Juice (raw)	" "	26,600 Gals.
Lime Juice (concentrated)		2,989 Gals

	Live Stock	
	1917	1918
Horses	957	1,002
Donkeys	6,501	5,332
Mules	2,148	2,359
Cattle	95,643	77,108
Buffaloes	80	176
Goats	13,691	11,236
Sheep	21,970	20,611
Swine	11,776	12,532

Meteorological Data, January—March 1919.

Months.	RAIN FALL. Inches.	NUMBER OF DAYS OF RAIN Under ·10 Inches	·10 to ·50 Inches	·50 to 1.00 Inches	1.00 to 2.00 Inches	Above 2.00 Inches	Total day	EVAPORATION Inches
BOTANIC GARDENS—GEORGETOWN.								
January	4.60	3	11	.	1	.	15	4.82
February... ...	.45	6	1	.	.	.	7	5.19
March	9.11	6	7	3	2	1	19	5.10
Totals ...	14.16	15	19	3	3	1	41	15.11
BERBICE—BOTANIC GARDENS, NEW AMSTERDAM.								
January	4.04	5	7	2	1	.	15	.
February	.54	1	4	.	.	.	5	.
March	4.63	4	6	4	.	.	14	.
Totals ...	9.21	10	17	6	1	.	34	.
ONDERNEEMING—ESSEQUEBO.								
Januury	3.31	9	1	.	.	.	10	.
February... ...	25	2	1	.	.	.	3	.
March	6.89	4	4	3	2	.	13	.
Totals ...	10.45	15	6	3	2	.	26	.
MORAWHANNA—N. W. DISTRICT.								
January	8.88	7	13	.	.	1	21	.
February... ...	.73	8	3	.	.	.	11	.
March	7.32	8	9	2	.	1	20	.
Totals ...	16.93	23	25	2	.	2	52	.

AIR TEMPERATURE AND HUMIDITY.

BOTANIC GARDENS—GEORGETOWN

Months.	Air Temperature Maximum.	Minimum.	Mean.	Humidity. Mean.
January ...	83.6	74.9	79.2	81.4
February ...	84.5	75.9	80.2	76.1
March ...	84.5	76.0	80.2	78.9
Means ...	84.2	75.6	79.9	78.8

BERBICE BOTANIC GARDENS—NEW AMSTERDAM.

Months.	Maximum.	Minimum.	Mean.	Humidity Mean.
January ...	90.5	73.5	82.0	72.1
February ...	81.8	74.4	78.1	69.2
March	90.0	72.5	81.2	71.9
Means ...	87.4	73.4	80.4	71.0

ONDERNEEMING—ESSEQUEBO.

Months.	Maximum.	Minimum.	Mean.	Humidity Mean.
January ...	84.3	74.3	79.3	81.2
February ...	84.4	75.2	79.8	88.2
March... ...	83.8	76.3	80.0	84.0
Means	84.1	75.2	79.7	84.4

THE PRINCIPAL VARIETIES OF SUGAR CANE UNDER CULTIVATION IN B. GUIANA DURING 1918.

BY THE DIRECTOR OF SCIENCE AND AGRICULTURE

The following tables indicate the yields obtained, and the acreage under cultivation of the principal varieties of Sugar Cane for the crops of 1918 in B. Guiana. The tables are compiled from the results supplied by all the plantations that reported.

CROPS OF 1918.

	D 625		D 145		B 208	
	Yields.	Acreage	Yields.	Acreage	Yields.	Acreage.
Means, all plantations .	1.65	22,538	1.87	2,322	1.37	3,453
Maximum reported .	2.97	2,126	3.76	4	2.66	10
Minimum reported .	.80	172	.74	28	.59	8

	Bourbon.		D 185		Green Transpt.	
	Yields.	Acreage.	Yields.	Acreage.	Yields.	Acreage.
Means, all plantations...	1.61	3,185	1.60	914	2.03	472
Maximum reported.	2.40	172	2.00	12	3.27	45
Minimum reported ...	.90	309	1.15	37	1.11	7

	D 118		D 167		D 419	
	Yields.	Acreage.	Yields.	Acreage.	Yields.	Acreage.
Means, all plantations .	1.87	1,754	1.78	100	1.83	464
Maximum reported ..	2.85	7	3.60	2	3.07	3
Minimum reported	.72	37	1.20	6	1.29	5

	Java varieties		Ba 6032		D 721	
	Yields.	Acreage.	Yields.	Acreage.	Yields.	Acreage
Means, all plantations..	1.76	313	1.88	33	2.74	19
Maximum reported ...	2.33	204	2.50	3	3.08	18
Minimum reported ...	1.16	37	1.10	5	2.40	1

	D 651		B 6,450		D 116	
	Yields.	Acreage.	Yields.	Acreage.	Yields.	Acreage.
Means, all Plantations ..	2.59	14	2.25	31	1.11	6
Maximum reported .	3.25	1	3.50	5	1.23	
Minimum reported ..	1.80	13	1.65	4	1.00	

	D 216		D 109		Mixed	
	Yields.	Acreage.	Yields.	Acreage.	Yields.	Acreage.
Means, all plantations...	1.59	77	1.47	269	1.76	6,259
Maximum reported ...	2.07	19	1.82	138	2.91	79
Minimum reported ..	1.11	58	.75	105	1.00	201

The following tables indicate similar figures as the preceding but they are compiled from the results supplied by first class plantations only.

CROPS OF 1918.

	D 625		D 145		B 208	
	Yields.	Acreage.	Yields	Acreage.	Yields.	Acreage.
Means, 1st-class plantations only ...	1.77	19,866	1.93	2,294	1.47	2,445
Maximum reported	2.97	2,126	3.76	4	2.66	10
Minimum reported ...	1.00	62	1.20	144	.66	24
	Bourbon		D 118			
	Yields.	Acreage.	Yields.	Acreage.		
Means, 1st-class plantations only ..	1 75	2,373	1.91	1,717		
Maximum reported	2.00	172	2.85	7		
Minimum reported .	1.30	622	1.29	206		

Among the many varieties of Sugar Cane reported upon by the sugar plantations the following are worthy of note—

Variety.	Acreage.	Yields.
D 216	4	3.64
D 246	1	3.25
D 433	7	3.00
Q 581	5	3.00
B A 10 (12)	3	3.00
D 721	19	2.74
D 179	27	2.57
B 3412	48	2.55
D 651	14	2.52
R P 6	5	2.27
B 3922	17	2.16
D 199	37	2.15
R P 21	72	1.98
R P 73	113	1.94
R P 23	73	1.91
Q 37	62	1.88
B A 6032	17	1.88
R P 8	291	1.85

The following table indicates the increase or decrease in area of all the principal varieties of canes grown in British Guiana for the year 1918 and those intended for 1919.

PRINCIPAL VARIETIES OF CANES—1918 AND 1919.

AREAS IN BRITISH GUIANA.

Variety.	1918.	1919.		
	Acres.	Acres.	Increase.	Decrease.
D 625	36,000	34,142		1,858
Bourbon	4,950	3,465		1,485
Bourbon mixed with other varieties	7,800	7,806	6	
D 145 ...	5,920	4,667		1,253
B 208	4,550	3,601		949
D 109 ..	320	388	68	
Diamond 185	1.120	930		190
Green Transparent ..	1,320	1,131		189
D 118	2,710	2,676		34
D 419	1,370	1,675	305	
Java Seedlings J 100	302	381	79	
Others	328	126		202
B 147	110	186	76	
D 167	140	138		2
D 4399	46	13		33
B 6450	43	58	15	
Diamond 37	89	106	17	
B 376	350	394	44	
D 4397	17	29	12	
B A 6032	56	112	56	
B H 10 (12)	—	34	34	
D 216	116	83		33
D 179	49	63	14	
R P 1 ...	72	72		
R P 8	429	485	56	
R P 21..	79	97	18	
R P 23..	77	77		
R P 73 ..	121	150	29	
D 418		47	47	
D 199 ...	47	42		5
Small areas of other varieties and areas under varieties unenumerated	9,692	10,640	958	
	78,223	73,814	1,834	6,233

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	1,718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,200
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,886
1918 1st Quarter	1,085	812	397	1,013	409	684	518	4,918
2nd Quarter	1,110	554	427	727	526	609	529	4,482
3rd Quarter	1,285	794	498	702	559	796	376	5,010
4th Quarter	1,354	921	331	229	66 8	701	644	4,848
1919 1st Quarter	965	626	256	749	450	639	515	4,200

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the first three months of 1919. The corresponding figures for the two previous years and the averages for the four years previous to that are added for convenience of comparison.

Product.	*Averages 1913-16.*	*1917.*	*1918.*	*1919.*
Sugar, tons ...	19,439	27,791	17,757	22,180
Rum, gallons	1,281,301	1,458,439	359,129	1,865,365
Molasses, gallons	28,435	200	7,400	164,113
Cattle-food, (Molascuit) tons	1,121	755	575	435
Cacao, cwts. ...	99	None	50	None
Citrate of Lime, cwts.	4	14	None	5
Lime Juice, gals....	No records	1,264	1,800	None
Essential Oil of Limes, gals.		13	None	5
Coconuts, thousands	494	593	305	1,456
Copra, cwts. ..	558	205	827	762
Coffee, cwts. ...	607	1,493	823	5,751
Kola-nuts, cwts. ...	60	None	None	None
Rice, tons ...	2,830	5,895	4,185	638
Ricemeal, tons ...	260	42	5	None
Cattle, head ...	229	282	154	None
Hides, No. ...	1,359	997	115	2,291
Pigs, No. ...	372	318	None	None
Sheep, head ...	8	3	3	None
Balata, cwts. ...	2,580	3,067	1,165	2,004
Firewood, Wallaba, etc., tons ...	2,783	3,474	1,770	231
Gums, lbs. ...	553	112	None	None
Lumber, cub. ft. ...	89,287	39,930	27,082	59,508
Railway sleepers, No.	683	9,779	4,000	1,308
Rubber, cwts. ...	2	40	52	42
Shingles, thousands	459	550	614	747
Timber, cub. ft. ...	75,581	6,719	2,060	8,137
Coconut Oil, gals. ...	No available records	4,845	8,336	3,798
Charcoal, bags ...	16,522	11,562	8,295	11,941